plete homograft replacement of the heart and both lungs. Surgery **50**:842-845, 1961
5 Reitz BA, Burton NA, Jamieson SW, Bieber CP, Pennock JL, Stinson EB, Shumway NE: Heart and lung transplantation. Autotransplantation and allotransplantation in primates with extended survival. J THORAC CARDIOVASC SURG **80**:360-372, 1980
6 Scott WC, Haverich A, Billingham ME, Dawkins KD, Jamieson SW: Lethal lung rejection without significant cardiac rejection in primate heart-lung allotransplants. Heart Transplant (in press)
7 Craighead J: Cytomegalovirus pulmonary disease. Pathobiol Annu **5**:197-220, 1975
8 Esterley JA: *Pneumocystis carinii* in lungs of adults at autopsy. Am Rev Respir Dis **97**:935-937, 1968

New cannulation technique for the severely calcified ascending aorta

Leonard A. R. Golding, M.D., *Cleveland, Ohio*

From the Cleveland Clinic Foundation, Cleveland, Ohio.

Severe calcific atherosclerosis involving the femoral arteries, ascending aorta, right subclavian artery, and aortic arch precluded standard cannulation techniques for a patient requiring emergency revascularization. A cannula was passed from the apex of the left ventricle across the aortic valve to lie in the proximal ascending aorta, and successful cardiopulmonary bypass was achieved to allow revascularization.

Severe diffuse atherosclerosis can produce difficulties in cannulation for cardiopulmonary bypass. In almost all cases, however, vascular access can be obtained to allow completion of the circuit for cardiopulmonary bypass. In this case the severity of the atherosclerotic process resulted in inability to use any of the standard techniques for cannulation because the vessels felt essentially like solid tubes.

Case report. A 68-year-old woman was referred for coronary revascularization with Functional Class IV angina pectoris. Coronary arteriography showed an 80% left ostial obstruction with 80% obstruction in the dominant right coronary artery. Ventriculography showed normal ventricular function, but severe calcification was also noted throughout the whole ascending aorta extending into the arch. At operation this calcification involved the ascending aorta and continued into the arch with no evidence of any "soft spots." The calcification also extended into the right subclavian and carotid arteries. Exploration of both groins revealed severe diffuse atherosclerosis extending throughout the femorals and into the iliac arteries. Because of inability to construct the proximal end of a vein graft anastomosis to the ascending aorta, both internal mammary arteries were dissected from the chest wall, the patient was given heparin, and a two-stage venous cannula was inserted through the right atrial appendage. Aortic cannulation was achieved by passing a 20 Fr. end-hole armored venous cannula through the apex of the left ventricle and antegrade through the aortic valve to lie in the proximal portion of the ascending aorta. A small left ventricular vent was also positioned in the apex of the left ventricle to decompress this chamber (Fig. 1). Before the institution of cardiopulmonary bypass, no aortic regurgitation was noted on the arterial pressure record. The patient was placed on cardiopulmonary bypass and cooled systemically to 18° C. Bypass flows of 2.2 L/min/m^2 were achieved and the amount of drainage through the left ventricular vent did not exceed 300 ml/min. The left internal mammary artery was anastomosed to the left anterior descending coronary artery and the right internal mammary to the right coronary artery. The anastomoses were done with local occlusion only. The patient was rewarmed systemically to normothermia and then easily weaned from cardiopulmonary bypass. The postoperative course was uneventful with no alteration in the electrocardiogram or cardiac enzymes suggestive of myocardial infarction.

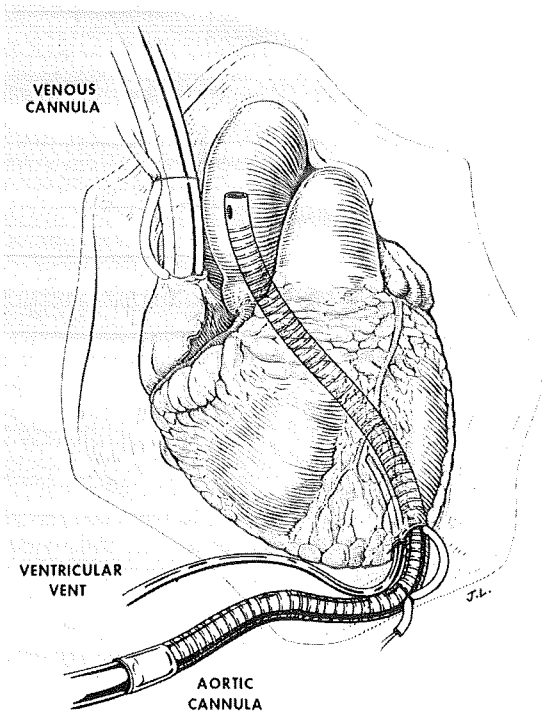

Fig. 1. Transapical aortic cannulation.

Discussion. In almost all cases cardiopulmonary bypass can be achieved with cannulation of the ascending aorta, femoral arteries, right subclavian artery, or the aortic arch. On a rare occasion the diffuse nature of atherosclerosis can preclude such techniques.

Address for reprints: Leonard A. R. Golding, M.D., The Cleveland Clinic Foundation, 9500 Euclid Ave., Cleveland, Ohio 44106.

Retrograde passage of a cannula across the aortic valve was originally described by Zwart and associates[1] as part of a left ventricular support system. We have also used this technique clinically and have demonstrated by echocardiography that the normal aortic leaflets mold around the cannula across the aortic valve, giving no evidence of aortic regurgitation.[2,3] The antegrade passage of the cannula allows for easy passage across the aortic valve. Obviously, such a technique is not practical for patients with calcific aortic stenosis, in whom the cannula could then completely occlude the aortic orifice, or in the presence of significant aortic regurgitation.

REFERENCES

1 Zwart HHJ, Kralios A, Kwan-Gett CS, Backman DK, Foote JL, Andrade JD, Calton FM, Schoonmaker F, Kolff WJ: First clinical application of transarterial closed-chest left ventricular bypass. Trans Am Soc Artif Intern Organs **16**:386-391, 1970

2 Golding L: A simplified blood access method for a temporary left ventricular assist system in humans. Artif Organs **2**:317-318, 1978

3 Golding LR, Groves LK, Peter M, Jacobs G, Sukalac R, Nosé Y, Loop FD: Initial clinical experience with a new temporary left ventricular assist device. Ann Thorac Surg **29**:66-69, 1980

Unusual interatrial communication after the Fontan procedure

G. R. Westerman, M.D., R. I. Readinger, M.D., and S. H. Van Devanter, M.D.,
Little Rock, Ark.

From the Departments of Surgery and Pediatrics, Arkansas Children's Hospital, and University of Arkansas for Medical Sciences, Little Rock, Ark.

Two patients are presented who illustrate unusual venous anatomy allowing right-to-left shunting at the atrial level after Fontan repair.

Arterial desaturation after a modified Fontan repair of tricuspid atresia or single ventricle is not unusual.[1-12] It may result from a variety of causes after repair in patients with or without previously performed Glenn shunts. We have encountered two patients in whom, after Fontan's procedure, a right-to-left shunt at the atrial level was via unusual coronary venous anatomy.

Address for reprints: G. R. Westerman, M.D., Arkansas Children's Hospital, Division of Cardiovascular Surgery, 804 Wolfe St., Little Rock, Ark. 72202.

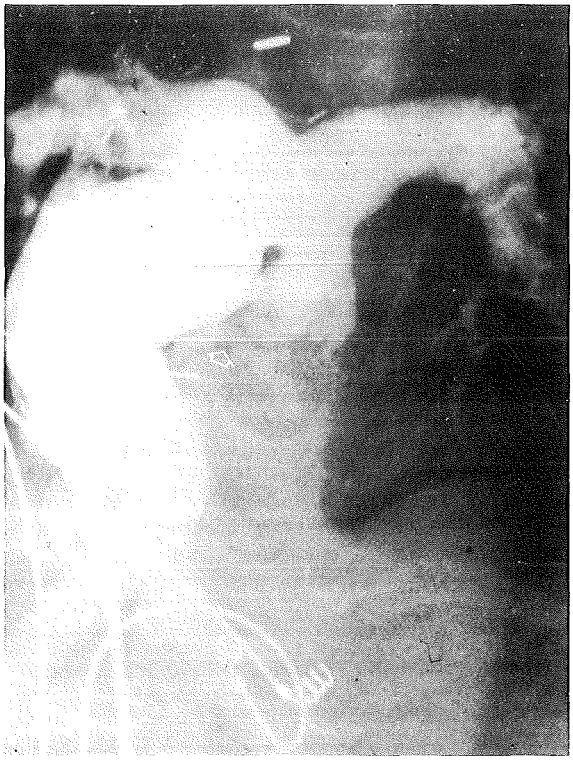

Fig. 1. Case 1. Right atrial injection; venous communication *(arrow)* between right atrium and coronary sinus located in left atrium.

The shunt was clinically insignificant in one patient but necessitated two reoperations in another.

Case reports.

CASE 1. A 5½-year-old boy was catheterized on April 30, 1982, with a diagnosis of single ventricle {S,L,L} and pulmonary valvular stenosis. Pulmonary artery pressure was 12 mm Hg (mean) and no gradient was measured across the bulboventricular foramen. The left atrium was fully saturated and systemic saturation was 89%.

On Sept. 14, 1982, he underwent a Fontan procedure with excision of the septum primum and patch diversion of the pulmonary venous return to both the left and right atrioventricular valves. The coronary sinus was diverted to the left side of the circulation. A direct communication was then established between the right atrium and pulmonary artery.

He underwent routine recatheterization on Aug. 3, 1983. The right atrial and pulmonary arterial pressures were 9 and 8 mm Hg, respectively. Left ventricular and aortic pressures were 105/15 and 105/72 mm Hg, respectively. Systemic arterial saturation was 97%. Contrast injection in the right atrium revealed a coronary vein that entered the left atrium via the coronary sinus but caused no significant desaturation (Fig. 1). He continues to do well on no medication with normal exercise tolerance.

CASE 2. A 2-day-old cyanotic infant was catheterized on June 28, 1981, the study confirming the echocardiographic diagnosis of tricuspid atresia type IA. A balloon septostomy