Fig. 2. Subtraction angiogram showing a pseudoaneurysm of the innominate artery *(arrow)*.

scribed in evaluating blunt thoracic trauma.[4] It can be performed safely and rapidly at the bedside, requires less time than aortography, and does not require contrast dyes. One report quoted sensitivity and specificity at 100% for recognizing traumatic aortic injury.[5] Transesophageal echocardiography can differentiate traumatic aortic rupture from ductus diverticulum, which can give a false positive aortogram. Its sensitivity in recognizing trauma to the innominate artery is unknown.

A recent article in this JOURNAL discussed the use of a vascular pericardial flap placed between the Dacron graft and the innominate vein to protect the vein from the oscillating movement of the graft.[6] We believe this flap is necessary only when the graft is placed anterior to the innominate vein. If the graft is placed in its normal anatomic position (posterior to the vein), the oscillating movement of the graft should not produce a sawing motion against the vein. Delay in diagnosis may lead to permanent injury or disability in the hand from distal small vessel thrombosis or to neurologic sequelae caused by ipsilateral carotid occlusion. Further delay can lead to exsanguination after delayed rupture. Cardiopulmonary bypass and heparinization are not necessary in achieving successful repair.

In summary, blunt injury involving the innominate artery is rare. Those patients who survive to reach the hospital may have minimal external signs of trauma. Surgical awareness, clinical suspicion, and aortography are essential in diagnosis.

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A simplified technique for selective jugular vein cannulation

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Hypothermic retrograde cerebral perfusion has been a successful method of cerebral protection during aortic

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arch operations.[1] This perfusion has generally been accomplished via a cannula in the superior vena cava. However, in some cases valves at the venous angle (jugular-subclavian junction) may not allow retrograde flow to the brain.[2, 3] One solution is to selectively place the cannula in the internal jugular vein above the venous angle to assure adequate cerebral perfusion.[4] We report a simple technique for selective internal jugular vein cannulation using a central venous catheter and a dissector for the microsurgical operation (Fig. 1).

After induction of anesthesia, a central venous catheter is percutaneously inserted into the right atrium via the right internal jugular vein. After thoracotomy, a purse-string suture is placed in the superior vena cava and a venotomy is made. The tip of the central venous catheter is pulled through the incision with a curved dissector (Fig. 2, *A*). A soft-tipped venous cannula (28F) is modified by cutting its tip so that it fits over the shaft of an Endo Dissect device (United States Surgical Corp., Norwalk, Conn.). The end of the central venous catheter is grasped by the jaws of the Endo Dissect device and the modified venous cannula is advanced over it (Fig. 2, *B*). Grasping the catheter with the Endo Dissect device prevents coiling, and the venous cannula can be easily slid into the internal jugular vein beyond the venous valves (Fig. 2, *C*). The Endo Dissect device is withdrawn, and the cannula is connected to the extracorporeal circuit. The cannula is used for venous drainage during conventional cardiopulmonary bypass and switched to the arterial return circuit during retrograde cerebral perfusion.

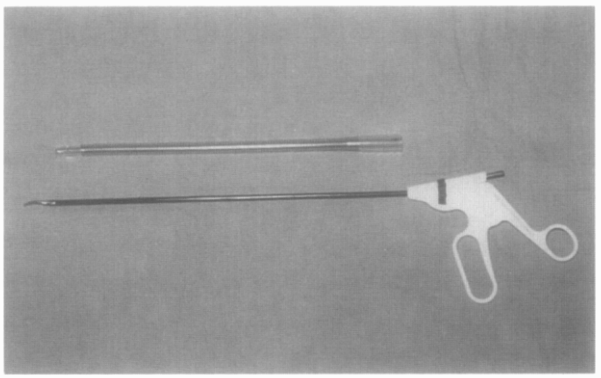

Fig. 1. A venous cannula and a dissector for the microsurgical operation (Endo Dissect device).

We[4] have previously described a technique for selective internal jugular vein cannulation through a right atriotomy for which a central venous catheter and guidewire are used. A drawback in the previous technique is the need for assistance of an anesthesiologist to exchange venous catheters. The new method has several advantages over the previous method: The procedure can be performed entirely within the operative field without any assistance; the cannula is inserted directly through the superior vena cava without the need for atriotomy; and it can be used for both venous drainage and arterial return without exchange. We have used this technique successfully in seven patients undergoing aortic arch operations. Because it is a simple technique that allows for rapid and reliable internal jugular vein cannulation, we recommend its use.

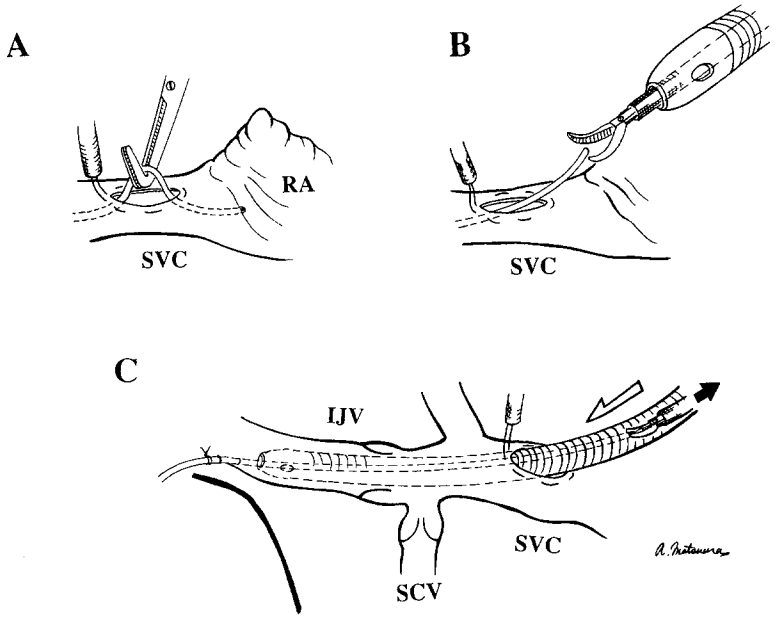

Fig. 2. Technique of selective internal jugular vein cannulation. *SVC,* Superior vena cava; *RA,* right atrium; *IJV,* internal jugular vein; *SCV,* subclavian vein.

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Anomalous left main coronary artery arising from the pulmonary artery in an adult: Treatment by internal mammary artery grafting

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Left main coronary artery arising from the pulmonary artery is reported to occur once in every 300,000 live births and accounts for 0.25% to 0.5% of congenital heart disease cases. Without treatment, most infants die during the first year of life. The small number who survive infancy presumably live until adulthood because of good collateral blood flow. Reports of surgical correction in adults are scarce. We present a case of this anomaly in an adult whose myocardial ischemia and left ventricular dilatation were completely reversed by use of the left internal mammary artery as a conduit for revascularization of the left coronary artery system after ligation of the origin of the anomalous left main artery from the pulmonary artery.

A 42-year-old woman sought treatment for fatigue and exertional dyspnea. Examination revealed precordial systolic and diastolic murmurs. Electrocardiography showed left ventricular hypertrophy. Transesophageal echocardiography showed a dilated left ventricle (diastolic dimension 6.2 cm) and aneurysmal dilatation of the coronary arteries. The left main coronary artery orifice could not be identified in the left coronary sinus of Valsalva. Cardiac catheterization revealed a right-to-left shunt of 1.5 to 1. Angiography showed a markedly dilated right coronary artery with delayed collateral filling of the left coronary artery system, which drained retrogradely into the pulmonary artery via an anomalous left main coronary artery (Fig. 1). Exercise testing showed poor exercise tolerance, hypotension, and widespread ischemic changes. Thallium 201 perfusion scintigraphy demonstrated a large reversible anteroapical defect (Fig. 2).

In view of the clinical findings, surgical correction was recommended. During cardiopulmonary bypass, it was impossible to arrest the heart because of brisk oxygenated blood flow into the left coronary system from noncoronary collaterals. The left main coronary artery orifice in the pulmonary artery was identified posterolaterally on the left side and was oversewn from within and ligated on the outside of the pulmonary artery. The left internal mammary artery was anastomosed to the left anterior descending artery as a pedicle graft.

Three months after the operation, she was free of symptoms and had excellent exercise tolerance (9 minutes on the Bruce treadmill protocol compared with 4 minutes before the operation). Stress perfusion scintigraphy revealed uniform myocardial perfusion (Fig. 2). Echocardiography showed normal left ventricular size (diastolic dimension 5.5 cm). Doppler echocardiography demonstrated brisk antegrade diastolic flow down the left internal mammary artery.

An anomalous left main coronary artery arising from the pulmonary artery is a rare finding in adults. The demonstrated presence of coronary and noncoronary collateral blood flow in this case presumably contributed to the woman's survival beyond childhood. Because of the association with sudden death and myocardial ischemia, surgical correction is usually recommended once the diagnosis is established. However, the optimal surgical technique for adults with this coronary anomaly remains unclear. Possible surgical techniques include the following: (1) ligation of the left main artery with revascularization of the left coronary system using saphenous vein aorta-coronary bypass grafting[1] or internal mammary artery grafting, which has been reported in only one case[2]; (2) reimplantation of the left main artery to the aorta directly or indirectly through a pulmonary artery tunnel[3] or via an internal iliac artery graft.[4] Saphenous vein grafts are well recognized to have poor long-term patency rates. Direct reimplantation of the left main artery to the aorta is often not technically possible because of unfavorable anatomy. Intrapulmonary tunneling has been associated with pulmonary valvular dysfunction.

The case presented here demonstrates that brisk antegrade blood flow and an excellent functional outcome can be obtained with the left internal mammary artery used as the conduit for revascularization of the left coronary system after its separation from the pulmonary artery. This is contrary to a previous suggestion that the difference in diameter between the mammary artery and the dilated left coronary artery system may cause competitive blood flow resulting in graft occlusion.[4] Because of the likelihood of long-term patency, the left internal mam-

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