Femoral Artery Puncture

The common femoral artery is punctured by inserting the Seldinger or single-wall puncture needle through the more lateral skin nick. Again, the needle is inserted at approxi- mately 45° along the axis of the femoral artery as palpated by the three middle fingers of the left hand. The experi- enced operator may feel the transmitted pulsations as the tip of the needle contacts the wall of the femoral artery.

With the Seldinger needle, it is customary to advance the needle completely through the artery until the perios- teum is encountered. The obturator is then removed, and the hub of the needle is depressed slightly toward the anterior surface of the thigh. Arterial pressure makes it unnecessary to attach a syringe to the cannula, so that both hands can be used to stabilize the needle as it is slowly withdrawn. When the needle comes back into the lumen of the femoral artery, as evidenced by vigorous pulsatile flow of arterial blood, a 0.035- or 0.038-inch J guidewire should then be advanced carefully into the needle.

If a single-wall puncture is desired, the operator may prefer a Potts-Cournand needle (Fig. 4.2), in which the obturator has a small lumen that transmits a flashback of arterial blood as the vessel is entered, or the same 18-gauge single-wall puncture needle described for venous entry. When the femoral pulse is difficult to palpate or numerous needle insertions have been fruitless, it may be easiest to use the 18-gauge SmartNeedle (Escalon Vascular Access, New Berlin, WI; see Fig. 4.2, bottom panel). The obturator of this device contains a Doppler crystal that picks up pul- satile arterial or more continuous venous flow, and thereby helps aim the needle tip toward the center of the desired vascular lumen.

Whichever needle is used to enter the arterial lumen, the guidewire introduced through the needle should move freely up the aorta (located to the right [patient's left] side of the spine on fluoroscopy) up to the level of the diaphragm. When difficulty in advancing the guidewire is encountered at or just beyond the tip of the needle and is not corrected by slight depression or slight withdrawal of the needle, the guidewire should be withdrawn to ensure that vigorous arterial flow is still present before any further wire manipulation is attempted. If flow is not brisk or if the wire still cannot be advanced, the needle should be

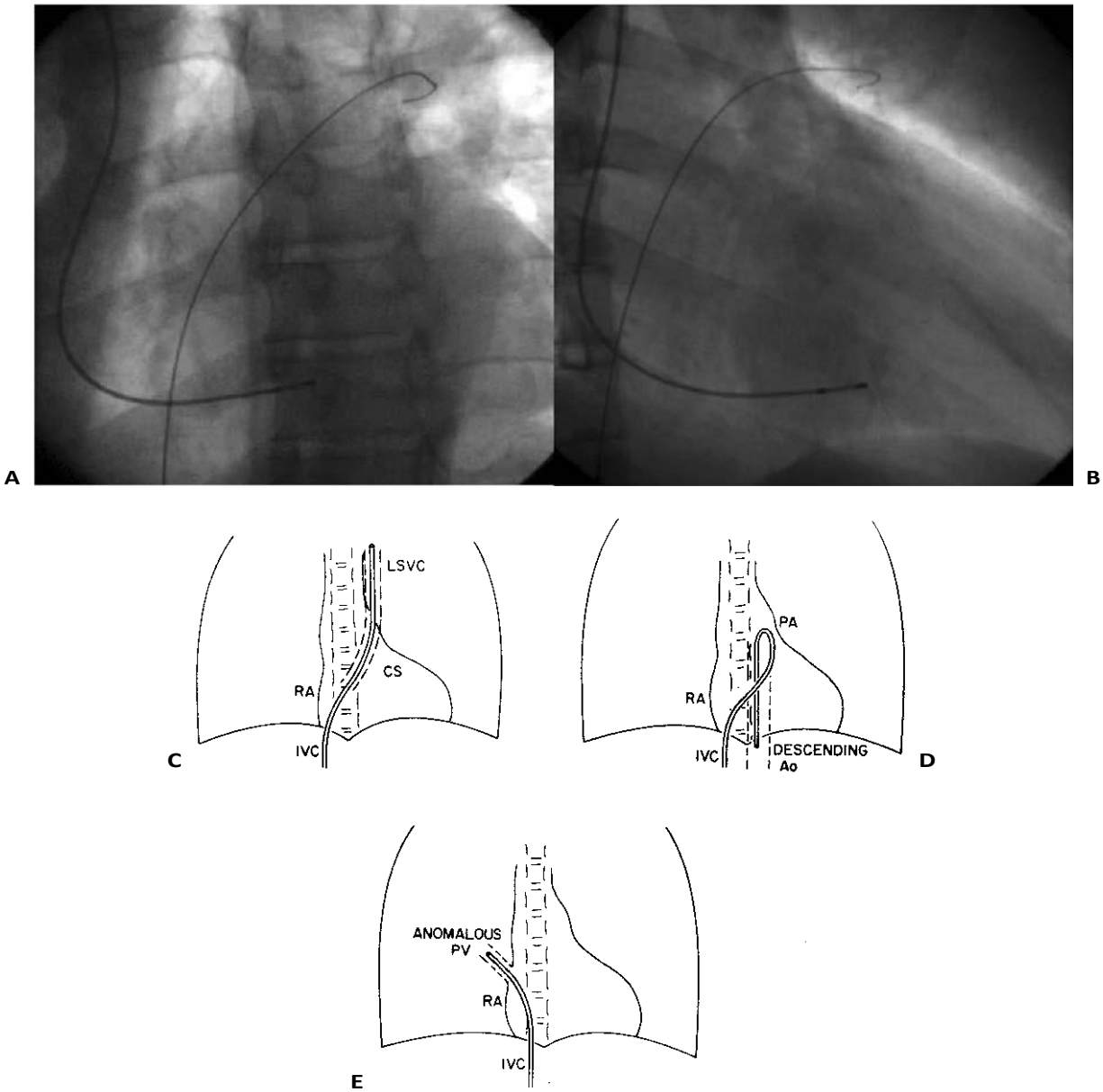

Figure 4.7 Alternative paths occasionally encountered while attempting to advance the right heart catheter from right atrium to ventricle. **A and B.** A J-tipped guidewire has crossed a patent foramen ovale into the left atrium and left upper pulmonary vein; the right anterior oblique view confirms that the guidewire has remained on the atrial side of the atrioventricular plane and thus could not be in the pulmonary artery. **C.** The course of a catheter passed from the femoral vein to the inferior vena cava (IVC), right atrium (RA), coronary sinus (CS), and up into an anomalous left superior vena cava (LSVC). **D.** The catheter crossing from the pulmonary artery (PA) to the descending aorta (Ao) by way of a patent ductus arteriosus. **E.** The catheter entering an anomalous pulmonary vein that drains into the right atrium.

removed and the groin should be compressed for 5 minutes. The operator should verify the correctness of the anatomic landmarks and attempt repuncture of the femoral artery. If the second attempt is still unsuccessful in allowing wire advancement, a third attempt on the same vessel is unwise, and an alternative access site should generally be selected.

If wire motion is initially free, but resistance is encountered after several centimeters (particularly if the patient complains of any discomfort during wire advancement), extensive iliac disease or subintimal wire position are distinct possibilities. The wire should be pulled back slightly under fluoroscopic control, and the needle should be removed as the left hand is used to stabilize the wire and

control arterial bleeding. After the wire is wiped with a moist gauze pad, a small (4F or 5F) dilator can be cau- tiously introduced to a point just below where wire move- ment became difficult. The wire is then withdrawn from the dilator, blood is aspirated to ensure free flow, and a small bolus of low osmolar contrast medium is then injected gen- tly under fluoroscopic monitoring. This should disclose the anatomic reason for difficult wire advancement—generally iliac tortuosity, stenosis, or dissection. Problems advancing the wire above the aortic bifurcation may also suggest the presence of an abdominal aortic aneurysm (7). Either can usually be overcome by use of a floppy steerable (Wholey wire, Malinckrodt, Hazelwood, MO) or hydrophilic (Glidewire, Terumo) guidewire, carefully reintroduced through the dilator in an attempt to reach the descending aorta, using extreme care to avoid perforation, dissection, or dislodgment of atherothrombotic debris (Fig. 4.8A). In an era when the obstructing lesion can be quickly and effec- tively treated by angioplasty or stent placement (see Chapter 27), iliac stenosis is no longer a firm indication to abandon trans-femoral left heart catheterization!

If contrast injection through the small dilator reveals that subintimal wire passage has occurred or that the ipsi- lateral iliac artery is occluded, retrograde left heart catheter- ization should be relocated to the other femoral artery, the brachial or radial artery. Patients with retrograde dissection should be observed for signs of progressive dissection or arterial compromise, both of which are fortunately rare with retrograde guidewire dissections.

In an aging population with diffuse atherosclerotic dis- ease, the question of performing left heart catheterization via a prosthetic (e.g., aortobifemoral) graft arises frequently (8,9). This is not an ideal approach because the graft wall is tough (making sheath insertion difficult), such grafts may contain diffuse atherosclerotic or thrombotic debris, and graft closure or serious graft infection may occur. The graft should be identified as a separate structure from the adjacent native femoral artery and punctured using a front-wall approach. Even if the graft hood is punctured correctly, the guidewire may pass through the anastomosis and into the native femoral artery rather than proximally up the graft (8). In that event, contrast injections through a small dilator in a RAO projection (right leg) will disclose the problem. Partial withdrawal of the dilator and the use of special steerable guidewires may then allow the wire to be redirected into the graft lumen and thereby reach the descending aorta (Fig. 4.8B). A vascular introducing sheath should always be used to avoid excessive friction during catheter movement or excessive traction on catheter tips during withdrawal, but ser- ial dilators may be needed to facilitate sheath passage through the tough graft wall. This approach via a vascular graft can thus be used with care, particularly when other alternatives (e.g., brachial, axillary, or radial artery) are them- selves less than desirable. Some operators choose to adminis- ter prophylactic antibiotics (Kefzol 1 gm every 8 hours for 24 hours) when achieving vascular access via a prosthetic graft.