

# Retrograde False Channel Perfusion

## A Complication of Cardiopulmonary Bypass during Repair of Dissecting Aneurysms

George Pappas, M.D., and Thomas E. Starzl, M.D.

**T**he current surgical treatment of dissecting thoracic aneurysms that originate above the aortic valve and dissect distally (Type I—De Bakey [3]) requires cardiopulmonary bypass for repair of the proximal intimal tear and obliteration of the false lumen [1, 2, 4, 5]. When the dissecting process extends toward the femoral arteries, cannulation of these vessels may result in perfusion of the false lumen. In addition, although a femoral cannula is inserted into the true lumen, perfusion of the false channel may occur through large reentry sites in the distal abdominal aorta or beyond the bifurcation. Retrograde arterial flow through the false lumen would jeopardize the blood flow to the central nervous system and to other vital organs. We have observed this complication in 2 patients with complete aortic dissection (Type I) during what appeared to be an otherwise adequate surgical procedure.

### CASE 1

A 59-year-old man was admitted with a diagnosis of acute dissecting thoracic aneurysm. Arterial angiography demonstrated involvement of the entire thoracic aorta with extension into the abdominal aorta. Within 24 hours of hospitalization, severe aortic valve insufficiency and cardiac decompensation developed. The patient underwent operation in December, 1967, and total cardiopulmonary bypass was instituted, using the left common femoral artery as the site of arterial cannulation. The aortic valve was replaced, and the intimal tear above the valve was repaired by resection and graft replacement of the ascending aorta. With the aorta cross-clamped during total body perfusion, it was evident that a major portion of the perfusion (3.3 liters per minute) was passing through the false channel, as evidenced by the tenseness of this structure. The pupils became pinpoint, and renal function ceased during and after bypass. Immediately post-operatively, a severe "wash-out" metabolic acidosis (pH 6.85) was diagnosed. The patient did not regain renal or central nervous system function, and he died 24 hours later. At postmortem examination the femoral arteriotomy entered the true lumen; however, the retrograde arterial flow had apparently occurred through a large reentry site in the distal abdominal aorta, causing extraluminal compression of and substandard flow through the branches proximal to this location.

From the Department of Surgery, University of Colorado Medical Center, and Veterans Administration Hospital, Denver, Colo.

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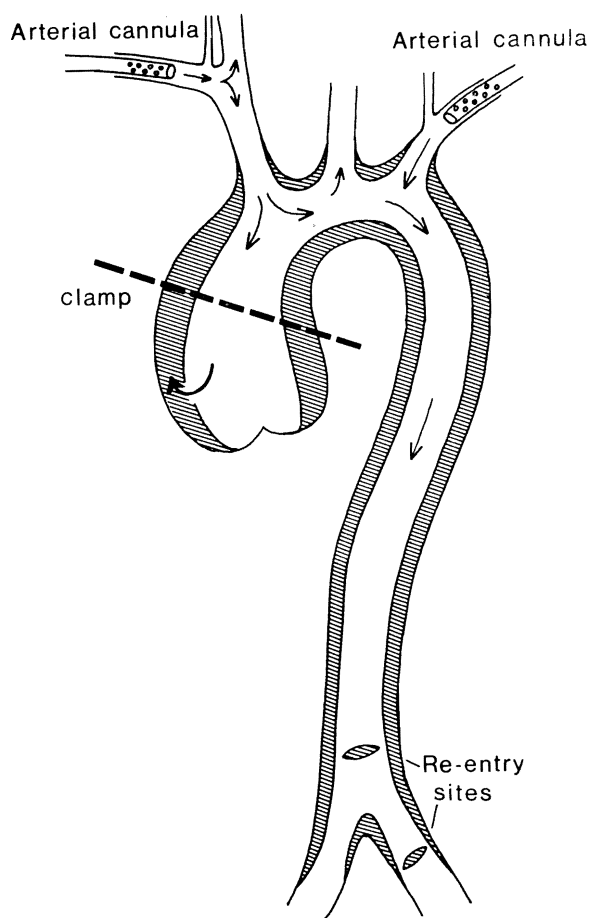
Address reprint requests to Dr. Pappas, Department of Surgery, University of Colorado Medical Center, Denver, Colo. 80220.

## CASE 2

A 35-year-old man was admitted with an acute dissecting thoracic aneurysm involving the entire thoracic and abdominal aorta. The patient underwent operation in December, 1962, and femoral arterial and venous cannulation was performed for total cardiopulmonary bypass. During resection of the intimal tear above the aortic valve and graft replacement of the ascending aorta, the vessels of the aortic arch were noted to be soft. The patient's pupils became dilated and fixed. He did not regain consciousness after operation and died a day later. Postmortem examination demonstrated that the arterial cannula was inserted into the true lumen, from which false-channel perfusion had evidently occurred through a large reentry site in the distal abdominal aorta.

## COMMENT

In both cases the patient's death was due to a combination of mechanical and hemodynamic factors. Although the femoral catheters were placed within the proper lumen, the jet stream of perfusate had



*FIG. 1. Bilateral axillary arterial cannulation for the repair of complete dissecting thoracic aneurysm (Type I). This approach may avoid the hazard of retrograde false-channel perfusion using femoral artery cannulation.*

apparently selectively passed through a distal reentry site, thereby distending the false channel and secondarily cutting off the blood supply to the brain and other proximal organs. There are no descriptions in the literature of similar accidents during treatment of dissecting aneurysms.

The risk from this kind of complication probably could be reduced significantly by using branches of the aortic arch for insertion of the arterial cannula (Fig. 1), particularly if appropriate preoperative angiographic studies of the potential insertion sites were obtained. An example of the kind of useful information that could be acquired in advance is shown in Figure 2. In this case of Type I acute dissecting aneurysm, a catheter inserted by transfemoral puncture left the true lumen and entered the false lumen at the level of the common iliac artery. As a consequence, the dye injection in the thoracic aorta was into the false lumen (Fig. 2A). In contrast, the continuity of the true lumen of the innominate and left subclavian arteries was proved in the same patient (Fig. 2B) by right brachial catheterization. Cardiopulmonary bypass was satisfactorily carried out using the axillary arteries for arterial inflow.

#### SUMMARY

Two patients with Type I dissecting aneurysm of the aorta died of hemodynamic accidents during cardiopulmonary bypass. In both cases

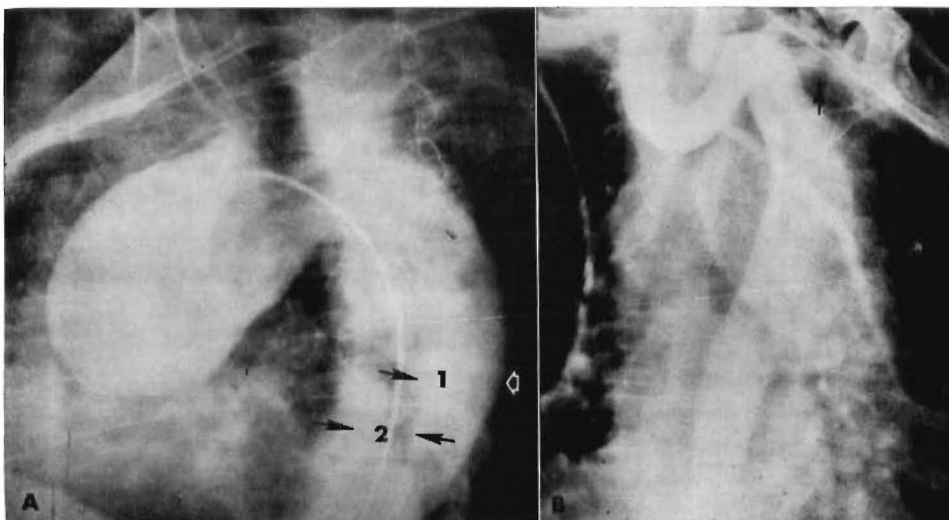


FIG. 2. Aortograms in a case of acute complete dissecting thoracic aneurysm. (A) By a transfemoral approach the catheter had ascended into the false lumen. The false lumen (1) and true lumen (2) are seen. (B) A transbrachial aortogram on the same patient shows the true lumen with intact branches of the aortic arch. Arrow indicates the left subclavian artery.

the arterial cannula was inserted into the true femoral artery lumen, but the jet stream of the perfusate apparently passed selectively through a reentry site into the false lumen. Cerebral perfusion was inadequate, and death followed from irreversible brain injury. Ways of preventing this complication are described.

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