

Operations on Large Arteries

Application of Recent Advances

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AS WITH THE PROBLEM of duodenal ulcer, surgical operation is not the answer to the problem of arteriosclerosis but it may be of considerable value in the treatment of complications of that condition. Whereas previously the therapy of vascular disease was limited to conservative measures and helping the patient to adjust to disability or to amputation—confession of therapeutic failure—now, in many cases, it is possible boldly to attack the cause of the poor circulation, the diseased artery itself.

Experiments of Murray and Best⁵ led to the use of heparin in connection with vascular operations, both general and regional,³ and so overcame the greatest obstacle to successful operations upon blood vessels, namely, thrombosis. Now with the use of anticoagulants the incidence of successful restoration of continuity has been greatly increased.

In 1947 DosSantos⁶ first reported upon his experience with thromboendarterectomy of a major artery. The success of this operation depends upon the fact that a line of cleavage is present between the viable portion of the blood vessel wall and the atheromatous plaque with the thrombus. Arnulf¹ used the term "sequestrum" to denote this obstructing material. After securing adequate control of the component arteries, the main vessel can be opened, the obstruction removed and the artery sutured. Anticoagulants have generally been used to prevent recurrence of thrombosis during the time required for a new intima to be formed. Although it is too early to evaluate this procedure from the standpoint of ultimate results (the first successful "sequestrectomy" of the abdominal aorta was performed in this country by Wylie⁷ of San Francisco only 18 months ago) the immediate results are often remarkable and gratifying.

An example of this new operation is the case of a patient with occlusion of the abdominal aorta and iliac arteries associated with severe hypertension.

CASE 1: The patient, 46 years of age, gave a history of sudden onset of weakness in both legs nine years previously. Symptoms of hypertension had developed one year pre-

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• *With the use of anticoagulants to prevent recurrence of thrombosis it is now possible to open a major artery which has been occluded by a thrombus, remove the thickened lining with the clot and restore the continuity of the vessel. Free vein grafts have been used successfully to replace arterial segments in the extremities. Vein inlay grafts are preferred in dealing with aneurysms of the abdominal aorta. The aneurysmal wall can be used to support the venous segments.*

It has been possible to by-pass aneurysms of the abdominal aorta by anastomosing the splenic artery to the left iliac artery. The use of the left superficial femoral artery as a by-pass to supply blood to the right leg is described.

viously. In a preoperative aortogram (Figure 1, *left*) complete occlusion of the abdominal aorta and iliac arteries was noted. The collateral circulation to the pelvis and lower extremities was effected mainly through the superior hemorrhoidal branch of the inferior mesenteric artery. There was also partial occlusion of the left renal artery. The blood pressure preoperatively was 210 mm. of mercury systolic and 100 mm. diastolic. Thromboendarterectomy of the aorta and iliac arteries was carried out. An organizing thrombus which partially occluded the orifice of the left renal artery was also removed. The patient made a splendid recovery

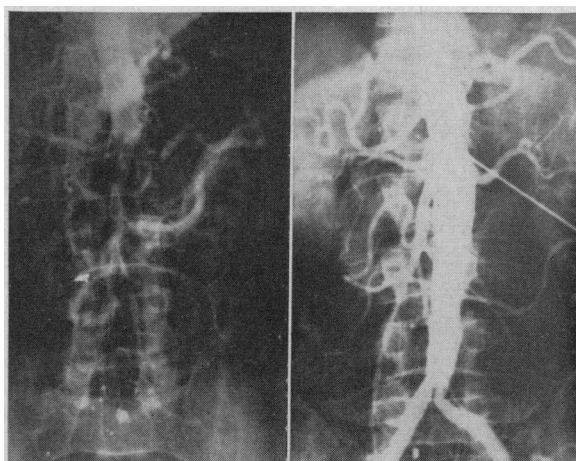


Figure 1.—*Left*, preoperative aortogram (Case 1). Complete occlusion of abdominal aorta and iliac arteries with partial obstruction of left renal artery. *Right*, aortogram following thromboendarterectomy, showing patency of the aorta, iliac, and both renal arteries.

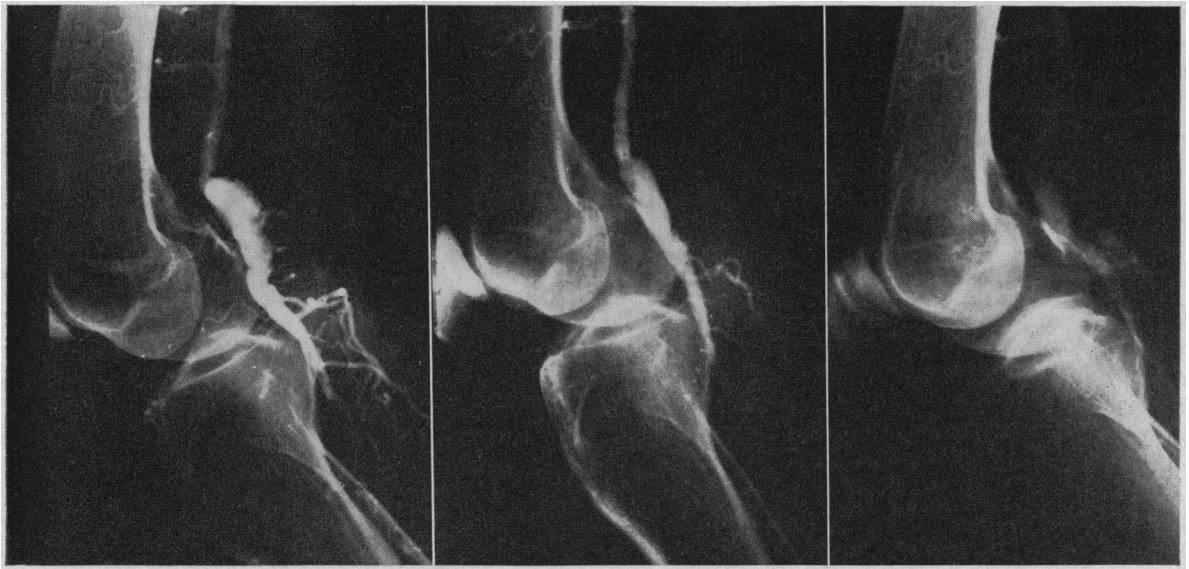


Figure 2.—*Left*, preoperative arteriogram of left popliteal aneurysm (Case 2) with early rupture. *Center*, two weeks after vein graft. *Right*, 18 months later. The calcification in the old aneurysmal sac was visible.

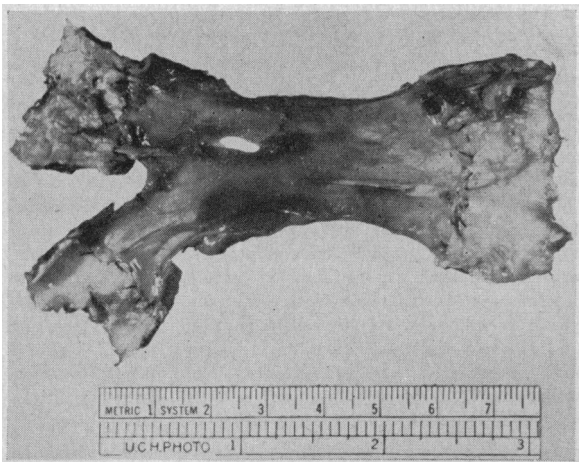


Figure 3.—Autogenous vein graft inserted into the terminal aorta of patient with an abdominal aneurysm. The rupture occurred ten hours postoperatively.

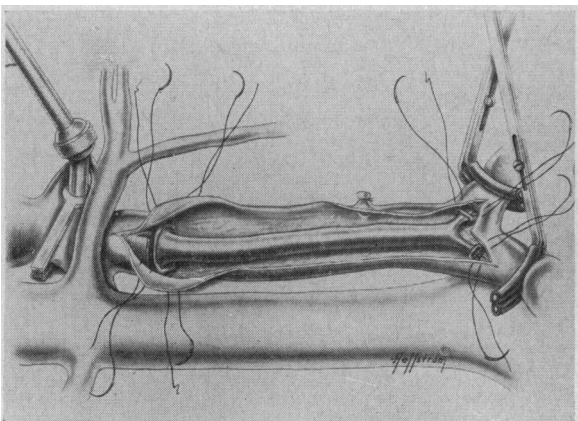


Figure 4.—Vein inlay graft of abdominal aorta using the left common iliac vein with its bifurcation.

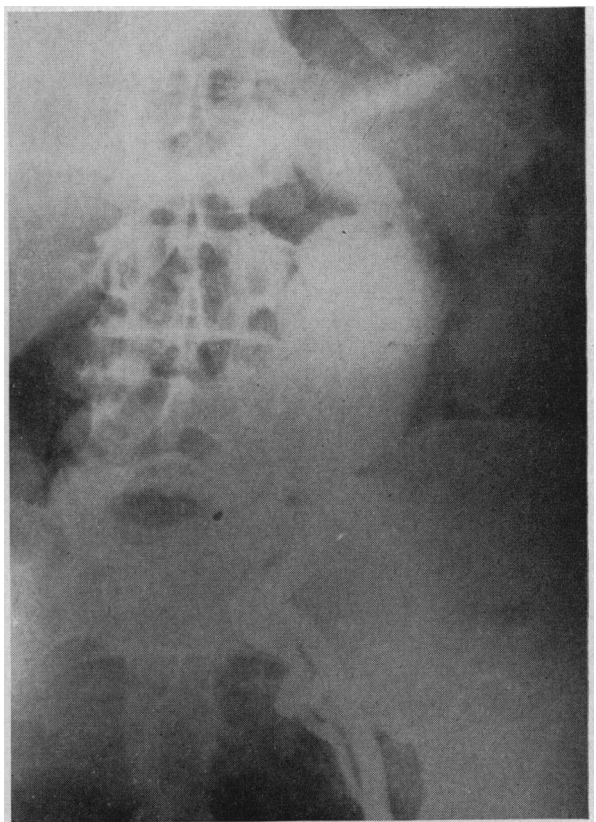


Figure 5.—A retrograde left femoral arteriogram, three months after operation, in a case in which continuity of the bifurcation of the abdominal aorta was restored by a technique in which the aneurysmal sac was used to support the venous segment. The patient was in good health 18 months after operation.

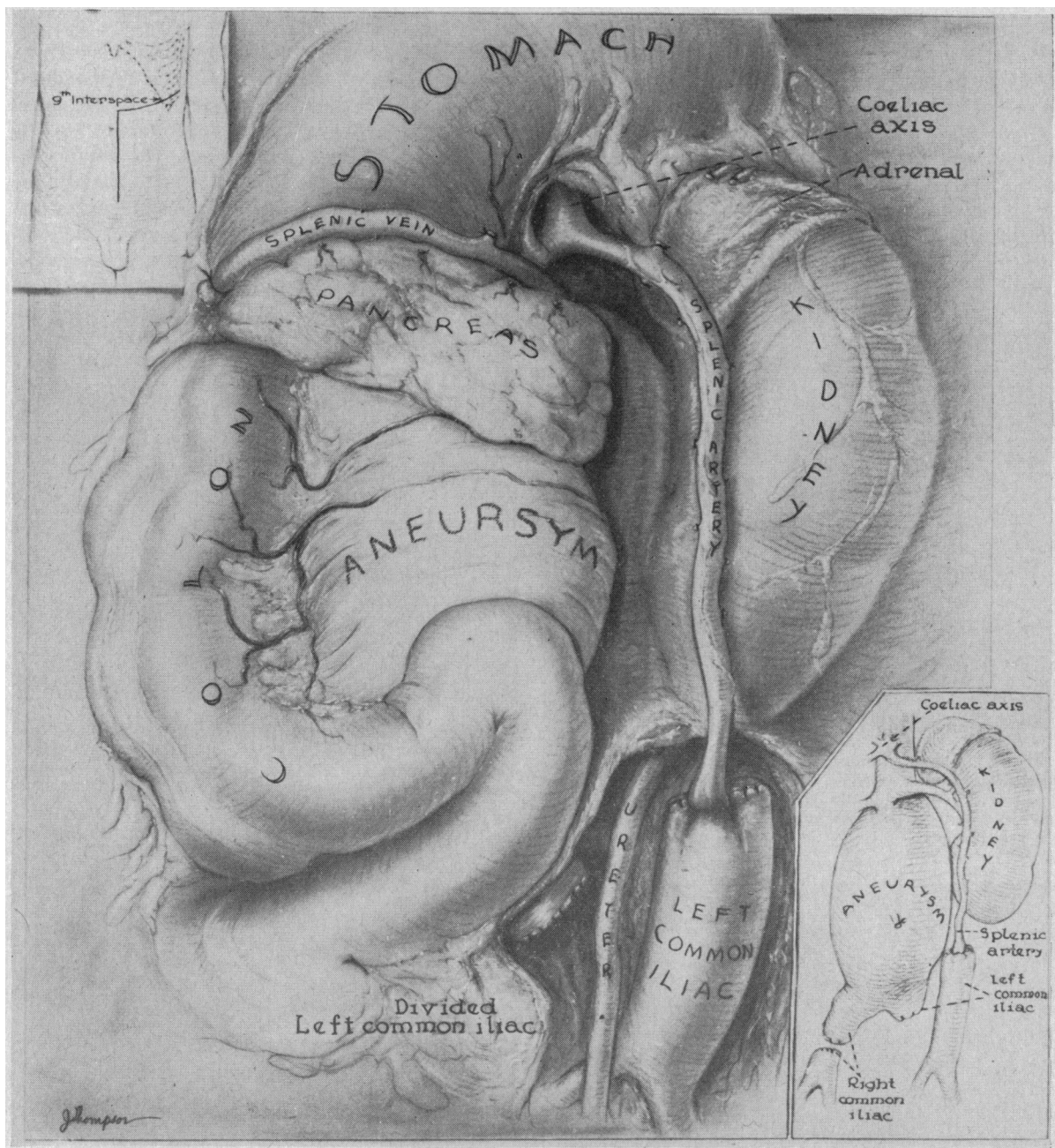


Figure 6.—Spleno-iliac arterial by-pass around aneurysm of abdominal aorta.

and, when examined three months after operation, had excellent circulation to both legs. The blood pressure was 120 mm. of mercury systolic and 72 diastolic. The post-operative aortogram is shown in Figure 1, *right*.

Vein grafts, both homologous and autogenous, have also been used to span the gap left by the removal of diseased arterial segments. The use of vein autografts in the surgical treatment of aneurysms has been sufficiently well established to permit brief reference. The dangers inherent in substituting a vein for an artery are not so great in the limbs where rupture need not necessarily lead to exsanguinating

hemorrhage. The patient in the following case has been followed for a sufficient period of time to permit adequate evaluation.

CASE 2: A man 69 years of age had a popliteal aneurysm which had started to expand and was causing pain. At operation a segment of the femoral vein was inserted to replace the section of diseased artery. In an arteriogram taken two weeks after operation the graft was observed to be patent, and 18 months postoperatively was still satisfactory (Figure 2).

In the treatment of abdominal aneurysms a free vein graft may be too hazardous. For example, the

fatal rupture of a segment of left common iliac vein with its bifurcation which had been inserted to replace the bifurcation of the abdominal aorta (Figure 3). The use of the aneurysmal sac to support the venous segment is illustrated in Figure 4. Within the past two years two patients have had successful restoration of the continuity of the bifurcation of the abdominal aorta by this technique. Figure 5 is an arteriogram taken in one of the cases. The patient was still in excellent health 18 months after operation.

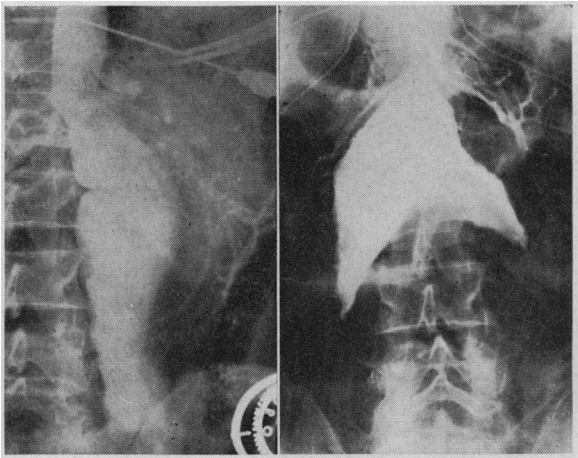


Figure 7.—*Left*, preoperative aortogram showing the large abdominal aneurysm. *Right*, postmortem study following fatal rupture of the left common iliac artery. The splenic artery can be seen partially filled just above the left renal artery.

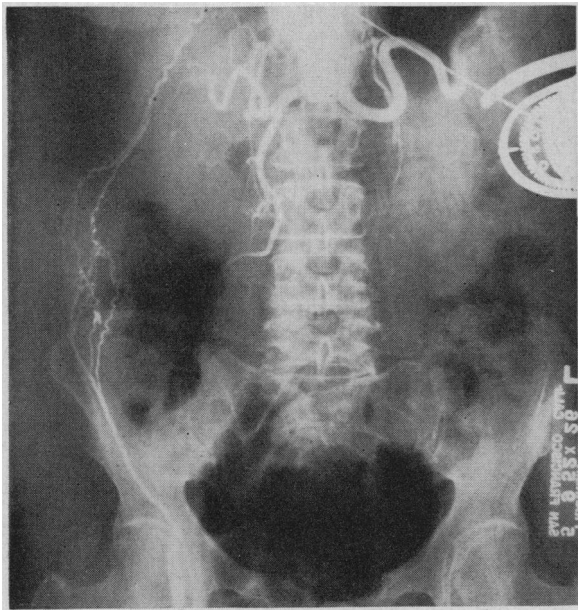


Figure 8.—Preoperative aortogram showing thrombosis of abdominal aneurysm extending to the celiac axis and involving the iliac arteries. Circulation to both kidneys was maintained through collaterals.

The use of an arterial branch to by-pass the diseased segment was first utilized by Blalock and Park² in anastomosis of the left subclavian to the distal aorta in the treatment of coarctation of that structure. Lam and Aram⁴ used a vein graft to by-pass an aneurysm of the thoracic aorta. The authors recently anastomosed the splenic artery to the left iliac in two cases to by-pass aneurysms involving the aorta and iliac arteries. Figure 6 illustrates the technique employed. The immediate result was satisfactory in the first case but the aneurysm ruptured three weeks after operation. The preoperative aortogram and the study made after death in this case are

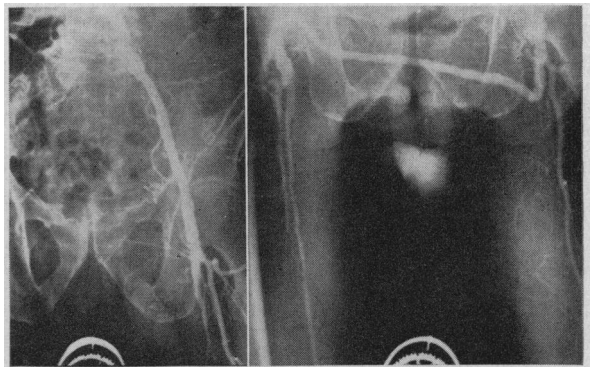


Figure 9.—*Left*, thrombosis of right iliac artery following thromboendarterectomy of left iliac artery. *Right*, arterial by-pass, left superficial femoral to right common femoral.

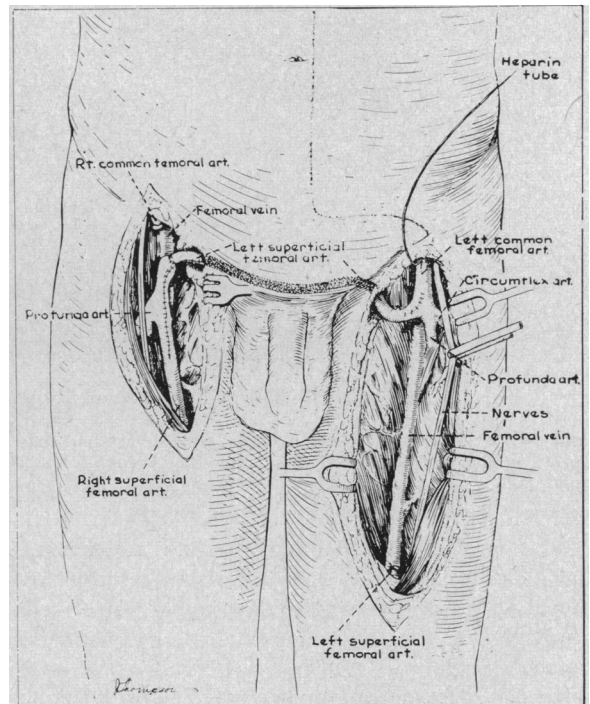


Figure 10.—Use of left superficial femoral artery to supply blood to right leg.

shown in Figure 7. This by-pass technique was successfully used later in a patient with a thrombosed aneurysm of the abdominal aorta. The thrombus had extended upward as far as the orifice of the celiac artery. The preoperative aortogram is shown in Figure 8. After anastomosis of the splenic to the left iliac artery the aorta was divided below the renal arteries, the thrombus removed with a uterine curette, the aorta sutured and the aneurysm removed. After stormy convalescence the patient made good recovery. The left femoral pulse was palpable and the circulation to the right leg was adequate.

Another by-pass operation for a peripheral artery is illustrated by the case of a patient who had severe obliterative arterial disease of both legs. At the time of left ilio-femoral "sequestrectomy," an aneurysm of the right iliac artery was noted. Cellophane was wrapped about this arterial segment. Six weeks later, thrombosis occurred with gangrene of the toes of the right foot. In an aortogram (Figure 9), occlusion of the right iliac artery was observed. The right superficial femoral artery, however, was observed in subsequent films to be open. In addition it was noted in the aortogram that the circulation to the left leg was being carried on chiefly through the profunda femoris, indicating that the left superficial femoral artery was probably obstructed. At operation it was found that the left superficial femoral artery was occluded at the adductor tendon. It was divided at this point (see Figure 10), the obstruction removed and, after transposition beneath the tissues of the abdominal wall, was sutured to the distal end of the divided right common femoral ar-

tery. After operation (Figure 9, *right*) the arterial supply to both legs was carried on through the left common femoral artery. The circulation to both feet remained excellent with separation of the gangrenous tip of the fifth toe.

It is fully recognized that operative intervention does not solve the main problem—arteriosclerosis—since this condition is generally widespread and operation is limited to the particular vessel involved. However, it does give promise of relief of some of the complications when the disease is limited to a single vessel.

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