SURGICAL TREATMENT OF ARTERIOSCLEROSIS OBLITERANS

A Preliminary Report

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ENCOURAGING results have been noted in the majority of patients who during the past six months have received surgical treatment for arteriosclerosis obliterans of the aorta, the iliac, or the femoral arteries. The disease has been treated by resection of the occluded segment and establishment of continuity of the vessel with a frozen-dried arterial graft. In 12 of the 14 patients receiving the surgical treatment, the postoperative courses have so far been favorable.

Arteriosclerosis obliterans may be diffuse or segmental in nature. It tends to be diffuse in patients 60 years of age or older; whereas the segmental form usually occurs in patients 40 to 50 years of age in whom the arteries are otherwise mildly involved. Our preliminary report is limited to cases of the segmental form, since only this type is amenable to the surgical procedure of grafting.

In the segmental form of the disease, the presenting complaint is intermittent claudication of the back, buttock, hip, thigh, or calf, the location depending upon the vessel occluded. The principal finding is the absence of pulses below the point of occlusion in an otherwise essentially normal limb.

Angiographic visualization of the anatomic pattern reveals the details of the occlusion, which determine operability. A typical example of angiographic visualization is shown in figure 1: the occlusion is at the aortic bifurcation, extending approximately 2½ inches down the common iliac artery. The other vessels appear to be normal. Figure 2 shows the resected specimen, the graft used, the operative procedure, and the postoperative aortogram.

The salient features of the surgical procedure are:

Continuous spinal anesthesia offers the best control of the patient during operation.

To keep the graft open, adequate head pressure and volume flow must be provided during the operation and the immediately postoperative period by the maintenance of blood pressure at levels over 100 systolic and of pulse rate at 70 or above. As the diameter of the grafted vessel decreases, it becomes increasingly important to maintain the blood pressure and pulse rate at the specified levels.

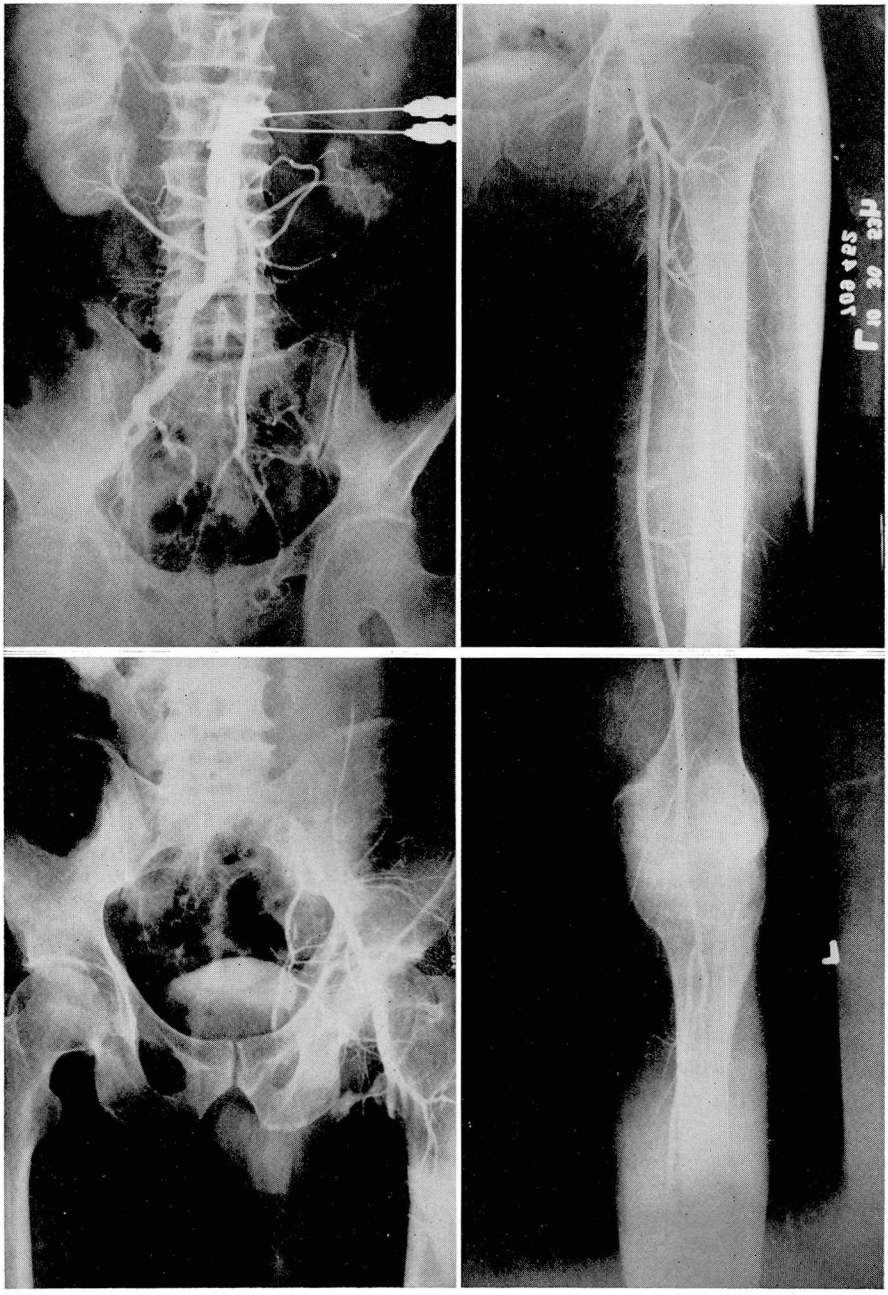

Fig. 1. Aortogram, retrograde arteriogram, and continuate arteriogram, showing block left common iliac artery.

Free flow of blood distal to the graft is essential. Obstruction of the flow can be determined preoperatively by continuate arteriography (fig. 1); and at surgery, after resection of the occluded segment, presence of free flow is evidenced by a forceful retrograde flow from the distal vessel.

To prevent embolization of operative soft clots, three safeguards are employed: (1) adequate washing of the lumina of the isolated vessels; (2) irrigation of the vessel to be anastomosed, by permitting a free flow of blood both in direct and in retrograde directions just prior to the closing of the anastomosis with the last two or three sutures; and (3) injection of 10 mg. of heparin into each isolated vessel at the time it is clamped off.

Intimectomy of the distal vessel is not advisable since the rough edge may be loosened from the wall by the flow of blood, fall across and block the lumen, or break free as an embolus. It may be necessary to do a proximal intimectomy in high aortic blocks.

Calcification of the host aortic bifurcation usually necessitates the use of a bifurcate graft in cases of unilateral common iliac artery occlusion. In these cases it is preferable to establish circulation to the unobstructed limb first, since it has not been protected by the development of collaterals.

Preservation of all possible collaterals is desirable, but frequently it is necessary to sacrifice those collaterals immediately above and below the occluded segment in order to anastomose the graft to a part of the vessel that is reasonably patent.

The inferior mesenteric artery may be transected, apparently without danger to the lower bowel; this is an important consideration, since this vessel frequently must be sacrificed in grafts to the aorta.

The preoperative and postoperative findings in our first 14 cases are reported in the table.

COMMENT

In 9 (cases 6–14) of the 14 patients, the results of operation are satisfactory at this time both to patient and to examiner. In three (cases 1, 2, and 4), although the symptoms of the presenting complaints have been appreciably relieved and the patient is satisfied with his condition, the blood supply has not been fully restored to the limb. In one of these three (case 4), exploration of the posterior tibial artery at the time of grafting revealed the artery to be occluded by old atheromata. In that case, and presumably in the other two, the lack of full restoration of blood supply is due to blocks distal to the graft. As has been stated above, free flow of blood distal to the graft is essential.

Case 5 was unusual in that when the patient was admitted the left leg was pregangrenous. Angiographic study showed occlusion of the left common iliac artery and both of its branches, and occlusion of the superficial femoral artery. The entire visualized supply of blood to the left leg was from the deep femoral artery which, in turn, was supplied only by collaterals derived from the aorta itself. The right common iliac artery had a large filling defect that did not

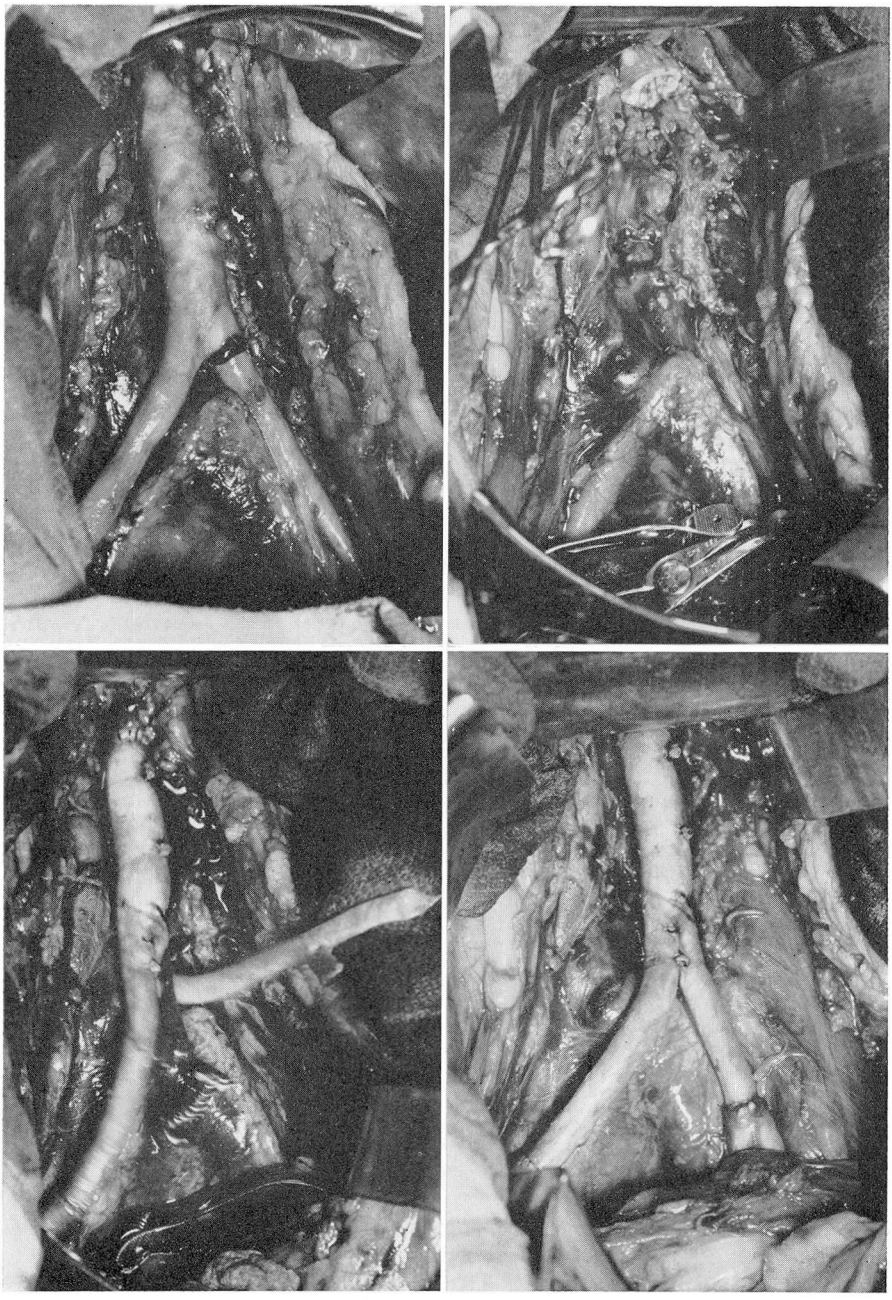

Fig. 2A. Operative procedure showing the exposed diseased artery, the aortic bed following resection, the right limb of the graft in place, and the entire graft in place.

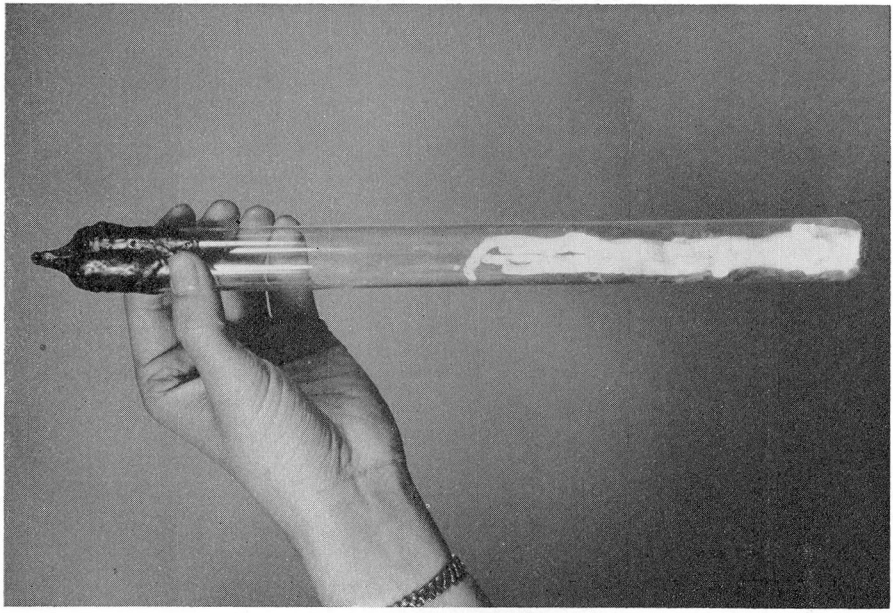

Fig. 2C. Frozen-dried aortic bifurcate graft.

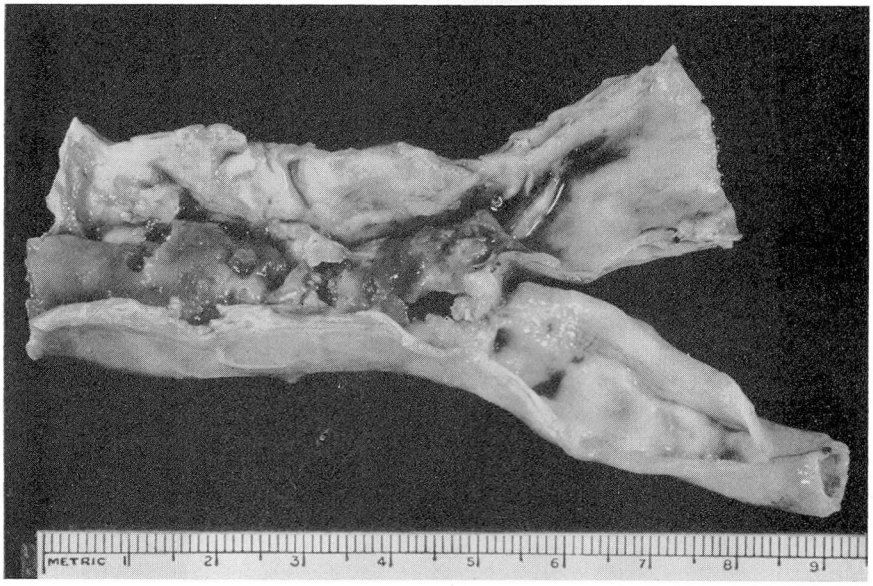

Fig. 2B. Resected specimen showing complete occlusion right iliac ostium.

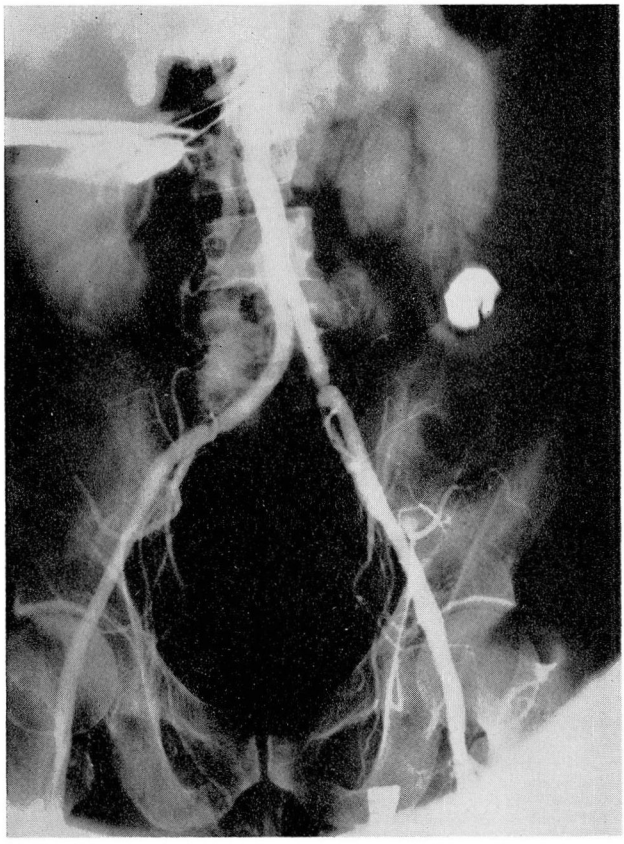

Fig. 2D. Immediate postoperative aortogram. The apparent narrowing at the anastomosis lines represents operative spasm in the host vessel and becomes mechanically dilated during the next few days.

completely occlude the lumen. At operation, the graft was placed from the aorta to the lower common iliac artery on the right, and to the common femoral artery just proximal to the deep femoral artery on the left. This was done to protect the right leg and with the hope that an improved head of pressure might save the left leg. The left leg improved for several weeks, after which time it reverted to its preoperative condition. Aortography at that time revealed that the right limb was patent, but the left limb of the graft was occluded at the bifurcation. This also is an example of partial failure of a graft due to the absence of a free flow of blood distal to it.

The other unsatisfactory result, case 3, occurred in a patient who died on the fifth postoperative day of renal failure following prolonged occlusion of the aorta proximal to the renal arteries.

TABLE

Preoperative and Postoperative Findings in 14 Patients Grafted for Arteriosclerosis Obliterans

Case no.	Age (yr.)	Walking distance before pain occurred; other complaints Preop.	Postop.	Sites grafted	PULSES Femoral Preop.	Femoral Postop.	Popliteal Preop.	Popliteal Postop.	P.T. Preop.	P.T. Postop.	D.P. Preop.	D.P. Postop.	Time Postop.	Remarks
1	51	Less than ½ block	2 blocks	C.F.	+	+++	0	0	0	0	0	0	6 mo.	
2	62	1 block	4 blocks	C.I.	0	+	0	0	0	0	0	0	6 mo.	
3	57	½ block	—	A.B.	0	—	0	—	0	—	0	—	5 days	Died; renal failure.
4	64	1 block	4 blocks	F.	++	++	0	0	0	0	0	0	3 mo.	Despite absent pulses, walking distance markedly increased.
5	61	Rest pain, left leg	Unchanged	A.B.	L 0 R +++	0 ++++	0 ++	0 +++	0 +++	0 ++	0 0	0 ++	1 mo.	See Comment, p. 199.
6	56	2 blocks	Unlimited	F.B.	0	++++	0	+++	0	+++	0	+++	4 mo.	
7	62	1 block	Unlimited	A.B.	L 0 R ++	++++ ++++	0 ++	++ +++	0 ++	+ +++	0 ++	0 +++	5 mo.	
8	48	½ block	Unlimited	A.B.	L ++ R 0	++++ ++++	0 0	++++ ++++	0 0	++++ ++++	0 0	++++ ++++	5 mo.	
9	65	1 block; night pain	Unlimited this leg	F.	L +++	+++	0	+++	0	+	0	+++	4 mo.	Untreated block present, right leg.
10	46	1 block	Unlimited	F.	+++	+++	0	+++	0	+++	0	0	3 mo.	
11	41	1 block	Unlimited	A.B.	L 0 R++++	++++ ++++	0 ++++	++++ ++++	0 ++	+++ ++	0 ++++	++++ ++++	2 mo.	
12	49	1 block	Unlimited	A.B.	L 0 R 0	++++ ++++	0 0	++++ ++++	0 0	++++ ++++	0 0	++++ ++++	2 mo.	Patient had had a prior resection of aortic bifurcation.
13	49	50 feet	Unlimited	A.B.	L 0 R +	++++ ++++	0 0	++++ ++++	0 0	++++ ++++	0 0	++++ ++++	1 mo.	
14	57	½ block	Unlimited	A.B.	L 0 R 0	+++ ++++	0 0	+++ ++++	0 0	+ +	0 0	+++ ++++	1 mo.	

Abbreviations used: C.F. —common femoral; C.I. —common iliac; A.B. —aortic bifurcation; F.B. —femoral bifurcation; F. —femoral

SUMMARY

In the segmental form of arteriosclerosis obliterans, angiographic visualization of the occlusion determines whether surgical treatment can be used. Resection of the occluded segment and establishment of continuity of the vessel with frozen-dried arterial graft has proved satisfactory in 12 of 14 patients so treated. The salient features of the surgical procedure are outlined.