Perspective Concerning Aorto-Femoral Arterial Reconstruction

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REVASCULARIZATION of the ischemic lower extremity can be accomplished by endarterectomy or bypass grafting with a plastic prosthesis. Many reports attest to the early success and durability of both methods, and each technic has its partisan adherents. This report presents a point of view regarding aorto-ilio-femoral occlusion and the results obtained from revascularization using a variety of technics.

Clinical Material

This study is based on a consecutive series of 223 patients operated on at the Affiliated Hospitals of Emory University School of Medicine from 1963 through 1969, for orto-ilio-femoral arterial occlusive disease. There were 192 men and 31 women. Ages ranged from 30 to 82; the median was 59. The frequency of patients with far-advanced symptoms of ischemic rest pain, pregangrenous lesions, or actual tissue necrosis is notable and many patients with claudication were severely incapacitated (Table 1).

Approximately 90% of these patients had one or more associated diseases (Table 2). The frequency of manifestations of coronary artery occlusive disease is easily documented by history, physical examination, and electrocardiogram. Other lesions in the cardiovascular tree were common and the association with diastolic hypertension is well known. These patients were not consistently studied for the existence of hyperlipidemia, but evidence for metabolic abnormality was high and is partially illustrated by the fact that 25% had diabetes mellitus. The patients almost unanimously had positive histories of tobacco smoking, though only 20% had significant bronchopulmonary disease.

Angiographic visualization of the terminal aorta and its ramifications was accomplished in all patients. While almost any combination of multiple lesions can be seen, a simplified classification is presented in Figure 1. Occlusive disease confined to the aortic bifurcation is the exception rather than the rule. Monoplane arteriography is often deceptive, since posterior plaques creating significant stenosis may not be seen with conventional views. It is common to find more extensive lesions than are detected on arteriography by careful examination of the external iliac arteries at operation. The segment of involvement is aorto-ilio-femoral in most instances and it is often associated with co-existing femoropopliteal stenosis or occlusion. In 35 patients a third segment of occlusion involving the popliteal outflow was seen. Such combinations are the rule when short-distance claudication, rest pain, or ischemic necrosis is present. All of the 28 patients with tissue necrosis had two or more segments of occlusion.

The operative procedures and early results are outlined in Table 3. When the major area of involvement was confined to the aorta and common iliac region, a local endarterectomy was done. In a number of in-

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stances, an aorto-iliac endarterectomy was extended into the external iliac a few centimeters and was often combined with patch-graft angioplasty. In later years in this series, such an extension was abandoned and aorto-femoral bypass is now done when there is significant disease in the external iliac artery. Especially in poor-risk patients, the operation was limited to reopening the occluded area when the dominant lesion was unilateral. This was the case in 31 of the 77 endarterectomies.

A knitted Dacron bifurcation prosthesis was used to bypass the aorto-ilio-femoral segments when occlusive disease extended to the common femoral arteries. Five patients with unilateral occlusion had a unilateral tube prosthesis. Co-existing femoropopliteal occlusions were sometimes corrected in the early part of this series, but in recent years, the primary procedure has been confined to the proximal segment. A patent profunda femoris is considered adequate run-off. Stenosis or proximal occlusion of this vessel is infrequent, but can be simultaneously corrected by endarterectomy and/or patch-graft angioplasty when present.

Postoperative thrombosis occurred in six patients and was corrected by secondary operation in five of the six. In these instances, femoropopliteal reconstruction was added for assurance of adequate run-off. The sixth patient required amputation. Causes of postoperative death were myocardial infarction in two patients and cerebral infarction, colon infarction, and necrotizing esophagitis in one each. Wound infections in the groin occurred in three patients, but were satisfactorily managed with preservation of flow. Of the 223 patients, 217 left the hospital with patent operated segments.

Ischemic rest pain was relieved in all instances and gangrenous lesions healed sec-

TABLE 1. *Indication for Operation*

Claudication (less than 200 yards)	142
Rest pain	53
Tissue necrosis	28
Total	223

TABLE 2. *Associated Diseases*

	No.	%
Arteriosclerotic heart disease	159	71
Diastolic hypertension	71	32
Diabetes mellitus (overt)	55	25
Bronchopulmonary diseases	43	20
Aortic aneurysm	27	13
Cerebral vascular disease	22	10
No identified associated disease	23	10

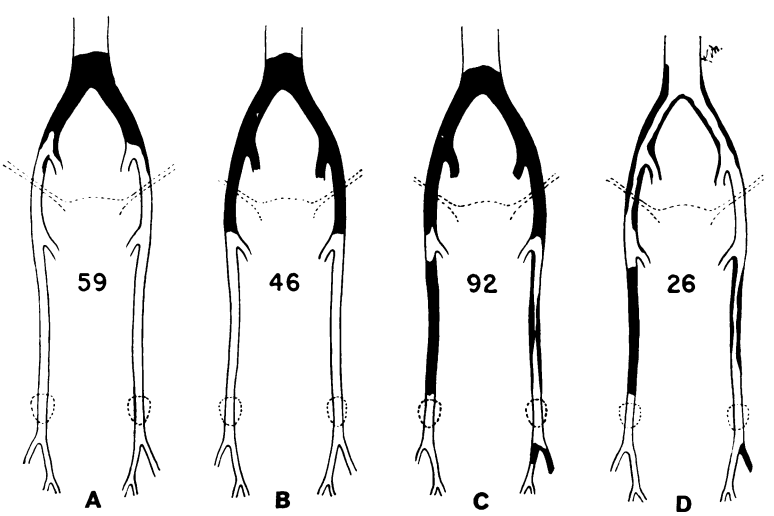

FIG. 1. Schematic classification of extent of involvement, patients with aorto-ilio-femoral arterial occlusive disease.

TABLE 3. *Operative Procedures and Early Results*

	No.	Deaths	Early Thrombosis
Endarterectomy			
Aorto-iliac	59	1	1
Aorto-Femoral	18	0	0
	77*	1	1**
(* 31 operations were unilateral)			
Dacron by-pass			
Aorto-femoral	131	3	5
Aorto-femoro-popliteal	15	1	0
	146	4	5**
(** Successfully converted in 5 of 6 instances by operation)			
Total operations	223		
Deaths	5 (2.2%)		
Amputations	1 (0.4%)		
Early patency	217 (97.4%)		

ondarily or following minor amputations. Claudication distance was usually improved, but was not totally eliminated in patients with uncorrected femoropopliteal occlusion. In such instances, elective secondary operations were considered. In the vast majority of instances, the patients were satisfied with the degree of improvement and declined further operation. Five patients had subsequent femoropopliteal reconstruction to relieve claudication. These plus the ones who had early femoropopliteal reconstruction constitute 21% (25 of 118) of those with significant femoropopliteal occlusion.

Follow-up of these patients ranged from 1 to 7 years, with a mean of 36 months. Late thrombosis of the operated segment occurred in five of 76 surviving patients (6.6%) with endarterectomy and six of 142 (4.2%) surviving with bypasses. A second revascularization was accomplished in five of these and six (2.8% of series) had major amputations. Progression of disease distal to the operated segment in two poor-risk patients resulted in elective major amputations. False aneurysms in the groin in three patients were successfully repaired at intervals of one to three years following the primary operation. Twenty-one patients died during follow-up. Causes of death were cardiac in 15, stroke in two, renal failure in one, and lung cancer in three. The final results to late follow-up are indicated in Table 4. Vigorous femoral pulses, healing of all lesions, and absence of incapacitating claudication were taken as indications of late success, and these conditions existed in living patients or to the time of death in 209 of the original 223 patients.

Discussion

Several points of emphasis are inferred from this study. Patients with significant lower extremity ischemia are usually those in an older age group with multiple diseases, including multiple sites of symptomatic atherosclerotic occlusive disease. The co-existence of manifestations of coronary artery occlusive disease is so great that we habitually assume its presence in any patient with peripheral occlusive disease. Operations, then, are essentially palliative in nature and are recommended for incapacity or the threat of limb loss. We believe such palliation is achieved when a comfortable limb is retained and when the patient can carry on reasonably normal daily activities without major limitation because of residual limb ischemia.

Operations of this magnitude inevitably produce additional loads on diseased organ systems. Most complications are related to pulmonary, cardiac, and renal function. Careful attention to pulmonary toilet and maintenance of circulating blood volume will minimize their occurrence.

Involvement of the aortic bifurcation extends well into the external iliac arteries more often than not. This is not always readily apparent on monoplane arteriography, and careful clinical examination at operation is required to evaluate the sig-

nificance of lesions extending beyond the iliac bifurcation. When major lesions are truly limited to the aorto-iliac segment, local endarterectomy appears to be a satisfactory means of correcting the occlusive disease.

When there is external iliac involvement, it is technically easier to use a bypass prosthesis to the common femorals distal to the inguinal ligament. There is less dissection and operative trauma, less blood loss, and the conduit more adequately circumvents a more extensive area of disease.[2, 5] We have not observed kinking of the prosthesis in the groin as a specific cause of recurrent occlusion, and such recurrent occlusion appears to be less frequent in the patients with a prosthesis than in those who had endarterectomies. The occurrence of false aneurysm in the groin was infrequent. No specific cause was found in our patients, and the lesions were successfully corrected.

Though occlusive disease sometimes appears to be unilateral, most patients have significant lesions on both sides. Bilateral revascularization is usually recommended even when symptoms predominate on one side, since progression of disease frequently necessitates secondary operations on the other side. A bifurcation prosthesis adds little to an operation that includes aorto-femoral anastomoses. In some poor-risk patients with advanced unilateral disease, operation on one side may be elected as a more expedient compromise.

Use of a prosthesis requires control of infections and prompt wound healing. Meticulous attention to surgical technic and concomitant use of antibiotics in intra-operative and postoperative treatment resulted in an infection rate in this series of just over one per cent. Such infections are often disastrous, but, fortunately, in this series were satisfactorily managed with preservation of flow. One patient developed late thrombosis after apparent control of an infection and did have limb amputation.

The importance of angiographic study of the entire distal arterial tree has been emphasized by Haimovici and Steinman.[1] Occlusive disease in the femoropopliteal segment often co-exists, and lesions thought to be primarily femoropopliteal are often associated with significant stenosis of the aorto-femoral segment. Proximal occlusive lesions must be corrected, and in instances when proximal stenosis exists, reconstruction of this area is essential to avoid a high rate of failure in a reconstructed femoropopliteal segment. Further, such proximal reconstruction may be sufficient to achieve the desired palliation. Morris[3] emphasized that a patent profunda femoris is sufficient run-off to maintain patency of a proximal reconstruction and allow healing of areas of ischemic tissue necrosis. Strandness[4] stated that objective improvement is not always demonstrable and that claudication may persist in many patients. We would agree that this is especially so when an area of proximal stenosis has been corrected, leaving residual femoropopliteal occlusion. In many instances, however, we have noted return of pedal pulses and marked improvement of claudication. In this series, almost 80% of the patients with co-existing aorto-ilio-femoral and femoropopliteal segments of occlusion obtained satisfactory palliation without further operation. When postoperative thrombosis occurs or when severe claudication persists, secondary femoropopliteal reconstruction may be done.

TABLE 4. *Final Results—Mean Follow-up 36 Months*

Operative death	5	
Early amputation	1	
Late amputation	8	
Total failures	14	(6.3%)
Late patency	209	(93.7%)
	223	

Summary

A series of 223 patients had aorto-ilio-femoral arterial reconstruction. A knitted

Dacron bifurcation prosthesis was used to bypass the diseased segment in most instances. The operative mortality was 2.2%. In a mean follow-up period of 36 months, 93.7% of the original patients obtained satisfactory palliation.

Inferences emphasized are the importance of complete arteriography, the coexistence of multiple sites of disease, and the importance of correcting impaired inflow to the profunda femoris artery.

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