

## THE PLACE OF THROMBENDARTERECTOMY IN VASCULAR SURGERY\*

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Pathologists have for many years been aware of the fact that, among the many protean manifestations of arteriosclerosis in the human body, there exists a small group in which narrowing of the calibre of the vessels may remain limited to certain of the larger arteries for prolonged periods without appreciable changes necessarily occurring in the rest of the vascular tree. The advent of arteriography in 1946, brought this entity into the limelight and renewed in the minds of surgeons what had long been a tantalizing prospect—the possibility of opening out these blocked or narrowed segments. Dos Santos<sup>1</sup> was the first to achieve this in 1947 by the operation now known as thrombendarterectomy. Following him invaluable work was carried out on this subject in Europe by men such as Le Riche<sup>2</sup>, Lemaire<sup>3</sup> and Bazy<sup>4</sup> and later by several surgeons in America, notably Wylie.<sup>5</sup>

Repeated arteriographic studies, coupled with an increasing number of operative findings during the last decade, has brought to light some important and interesting facts. Occlusion in the aorto-iliac zone usually begins as a localized area of intimal thickening, slowly encroaching on the arterial lumen and remaining latent clinically for many years. Wylie, has shown that ischaemic signs, at rest, are not produced until there is a reduction of 90% of the arterial lumen. As a result of the narrowing, an increasingly good collateral circulation is slowly brought into being. Narrowing continues to increase until the stage arrives when coagulation occurs in the lee of the stenosis—leading sooner or later to complete occlusion. Coagulation then extends to the nearest large arterial branch and as the branches are placed in close proximity in this area, the occluded segment is of necessity a limited one. In the femoral artery the same process probably occurs over a greater length of artery; as there are no large branches between the profunda and the popliteal bifurcation, the occlusion when it comes about extends down a long segment of the vessel. Aorto-iliac stenosis therefore tends to be latent and often remains undiagnosed, and complete occlusion when it occurs may be accompanied by minimal signs, with usually no tissue decay provided there are not occlusions elsewhere. Femoral stenosis on the other hand becomes clinically manifest earlier, and is often accompanied by marked ischaemic changes, going on to gangrene when the occlusion becomes complete.

*Signs and Symptoms*

The classical Le Riche syndrome—prone to fatigue, global wasting, impotence, pallor, absence of pedal pulses and trophic changes—is rarely seen in its

entirety. Thus palpable, if weak, femoral and pedal pulses are present in a large proportion of cases (15 and 9 respectively out of 18 cases in Wylie's series<sup>6</sup>). A noteworthy feature is the frequency of a systolic bruit at the inguinal ligament. Femoral obstruction invariably presents the picture of lower-leg claudication with absent pulses, colour changes and trophic lesions—depending upon the extent and completeness of the occlusion.

*The Operation*

Of paramount importance is an exposure wide enough to enable the surgeon to dissect the artery free and clamp it well above and below the occlusion, bearing in mind the fact that the intimal changes often extend considerably beyond the limits indicated by aortography. The artery is opened longitudinally, and the thickened intima incised at the lower limit of the lesion; the dissection is then carried proximally to its upper limit and the 'sequestrum' thus shelled out—a step which is usually carried out without much difficulty once the right plane of cleavage within the media is entered, except at the upper limit where careful sharp dissection is called for. The incision in the artery is then closed in the usual manner. Regional heparinization in the proximal and distal segments is maintained throughout.

Secondary thrombosis at the operation site has always been the biggest obstacle to contend with. In the early series the percentage was considerable, despite various forms of anti-coagulant therapy—even to the extent of the regional administration of heparin post-operatively by means of an indwelling polythene tube. In his last series, however, Wylie relies entirely on systemic heparin extending over the operative period only<sup>7</sup>; no thrombosis occurred in 62 cases. Another factor that has brought down the incidence of this complication is meticulous care to avoid leaving any intimal irregularity on which fresh clotting might occur; this applies particularly to the lower end of the 'filleting', where a thickened shoulder may lead to distal stripping of the intima by the bloodstream.

Dehiscence of the arterial suture-line with sudden haemorrhage (or aneurysm formation) is the other main problem. Although the incidence is small it must always remain an appreciable risk, unless reinforcing methods such as envelopes of fascia lata are employed for thin-walled vessels. It is disturbing to realize that this catastrophic event may occur up to 4 weeks after operation.

Both of these complications, however, apply to the same extent in the alternative method of treating these obliterative lesions, i.e. the replacement of the obstructed segment by cloth or homografts. As grafting is a much more formidable procedure it would appear that thrombendarterectomy for aorto-iliac obstruction will be used to an increasing extent. The position is not so assured with the lower vessels—

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external iliac and femoral. Although several surgeons<sup>7, 8</sup> claim a fair percentage of good results, the incidence of secondary thrombosis remains high—possibly owing to the fact that these lesions are usually associated with more diffuse changes. It is possible that with a careful selection of cases and more intensive anti-coagulation therapy these vessels will prove more amenable to endarterectomy than grafting—the figures for which are admittedly poor.

Lumbar ganglionectomy, carried out either before or concurrently with thrombendarterectomy, is being increasingly used on the grounds that the increased rate of blood-flow thereby produced will tend to limit thrombosis, and that post-operative vasospasm will be averted; further, an increased collateral circulation may prove a critical factor should secondary thrombosis extend beyond the pre-operative occlusion.

Our personal experience in this field is unfortunately too limited to permit us to submit a worth-while series nevertheless one feels that some of the lessons from the earlier difficulties we experienced might be of interest. One is that it is unwise to forecast the extent of necessary surgery on the aortographic findings alone. Nature has disobligingly allowed intimal deposits to form not only on the sides but at the front and back of these arteries, with the result that what might appear a simple problem from the A.P. view may seem vastly different from a lateral projection—if we could see one. Such lesions



Fig. 1. Aortogram showing a localized area of stenosis of the R.common iliac, which at operation proved to be much more extensive than the X-ray appearances suggested.

limited to the anterior and posterior walls can, however, be detected in a good aortogram by a localized diminution in the opacity of the dye. Fig. 1 is a case in point: The stenosis of the right common iliac appeared fairly easy to tackle, but at operation one found a tongue of

calcified intima extending an inch up the posterior wall of the aorta. Removal of this would not have proved unduly difficult but, not having a graft ready at hand, one felt that the possible risk of leaving the patient with a weakened aortic wall was too great to take in view of his minimal symptoms (mild fatigue on walking), and nothing more than a ganglionectomy was done. One feels, however, that if we accept the fact that such stenotic lesions are but precursors of complete occlusion they should be tackled early, as the technical difficulties are then much less owing to the shortness of the lesion and the absence of the perivascular changes which follow complete thrombosis. But the risk should be a reasonably safe one.

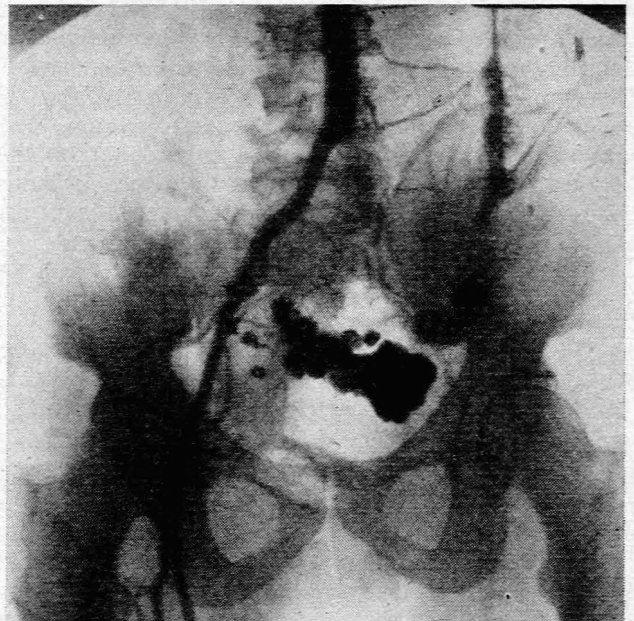


Fig. 2 (a). Aortogram showing localized area of obstruction of the L.common iliac artery, which appeared readily amenable to an endarterectomy.

This leads me to my second point—the necessity of having a graft available to fall back on, should unexpected difficulties arise. It is impossible to prejudge the state of the arterial wall and such ruptures as occur are nearly always due to necrosis of this structure. Few, even of the most ambitious, would care to see a patient who had walked into hospital for mild claudication leave on crutches. Another point, elementary though it may seem, is not to delay operation too long after arteriography has been carried out. Firstly, extensive thrombosis may occur in the interval without any dramatic change in the clinical state, and the conditions at operation may be found to differ widely from what was anticipated. Fig. 2 demonstrates this point. The original arteriogram suggested a relatively easy endarterectomy; but at operation 3 months later it was found that thrombosis had extended down to the femoral artery and, though the clot was milked out, a weak return flow presaged a

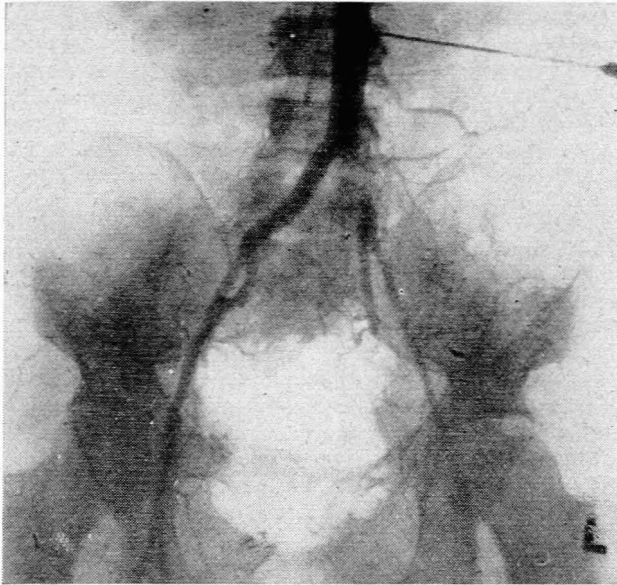


Fig. 2 (b). Aortogram taken after endarterectomy had been carried out, 3 months later. The common iliac artery has become re-obstructed owing to extension of thrombosis down the external iliac in the interim.

poor result. Secondly, there is the direct result of the aortic puncture. One has repeatedly found that lumbar ganglionectomy carried out within a week or two of aortography is made much more tedious because the anatomy is obscured by extravasation in the retroperitoneal tissues. If enough time has elapsed for the extravasation to become organized into fibrous tissue the operation is increasingly difficult, and if there has been any accidental leak of dye, almost impossible. Retrograde aortography through a femoral catheter will doubtless avoid this difficulty, though there will always

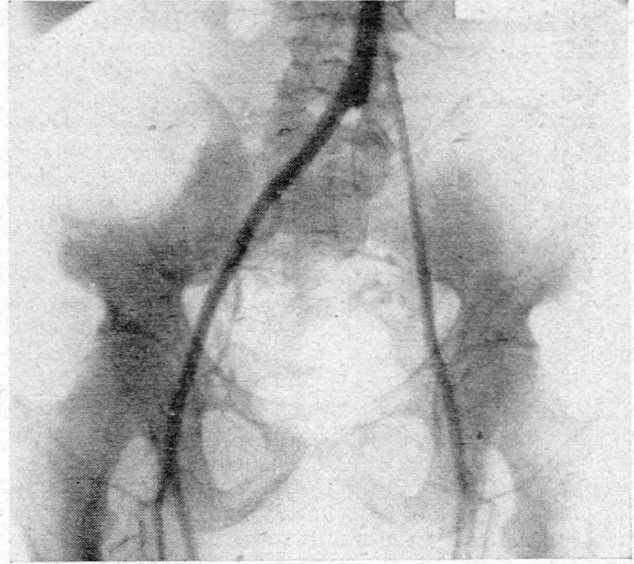


Fig. 2 (c). Aortogram taken 6 months after a by-pass homograft had been implanted. This should have been done instead of the original endarterectomy, had the extension of the thrombosis been appreciated.

be a certain proportion of cases in which this method is not feasible.

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