

NATURAL HISTORY OF ARTERIOSCLEROSIS OF THE LOWER EXTREMITIES

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by

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INFORMATION ABOUT THE course of arteriosclerosis has been imprecise or entirely lacking in the past. In the face of the clinical tragedies of myocardial infarction and limb amputation, the clinician's helplessness has led him to take a more gloomy view in individual patients than is warranted by the facts and in this he is supported by most written opinions. For example, Allen, Barker and Hines (1955) have said that 50 per cent. of patients are dead in three years.

In 1947 Professor A. M. Boyd set up a follow-up clinic at the Manchester Royal Infirmary, with three aims, firstly to find out what happened to the life and limb of the patient with arteriosclerosis, secondly to provide a standard of comparison for the variety of treatments which could be expected to arise, and thirdly to investigate the cause of the disease. This lecture is mainly concerned with the first two of these aims, the establishment of facts, and the consideration of present day practice in their light.

To do this, it was necessary to see a large number of patients and to follow them for a long time. It was decided to follow up all those patients with arteriosclerosis who presented with intermittent claudication and had no pregangrene or gangrene. Because of our known interest in this disease, patients were referred to the clinic who were not suitable for surgery and it is felt that they are relatively unselected compared to other surgical series.

Between 1947 and June 1953, 1,508 patients of this kind were seen, and it was then decided that this was probably enough. 20 patients by reason of residence abroad or other factors could not be followed up. 12 of the remaining patients have been lost to follow-up, leaving 1,476 for consideration.

Diagnosis has been described before (Boyd *et al.*, 1949). Most of the younger patients have had arteriography, but it has not been done in the others unless the performance of an operation allowed it. If any uncertainty in diagnosis occurred the patient concerned was reviewed until events or investigation resolved it. If doubt has persisted the patient

NATURAL HISTORY OF ARTERIOSCLEROSIS OF THE LOWER EXTREMITIES

has not been included in this series. At this first visit the anatomical site of the lesion was determined by clinical examination and oscillometry.

They were seen at three-monthly intervals or more frequently if necessary in the early stages of their disease, and later at six- and twelve-monthly intervals. As they died, the cause of death was obtained from the general practitioner or hospital. If the patient moved away or was unable to attend, then the help of a local clinic or his general practitioner was sought in doing an adequate follow-up. Patients have been surprisingly willing to travel long distances to attend the clinic.

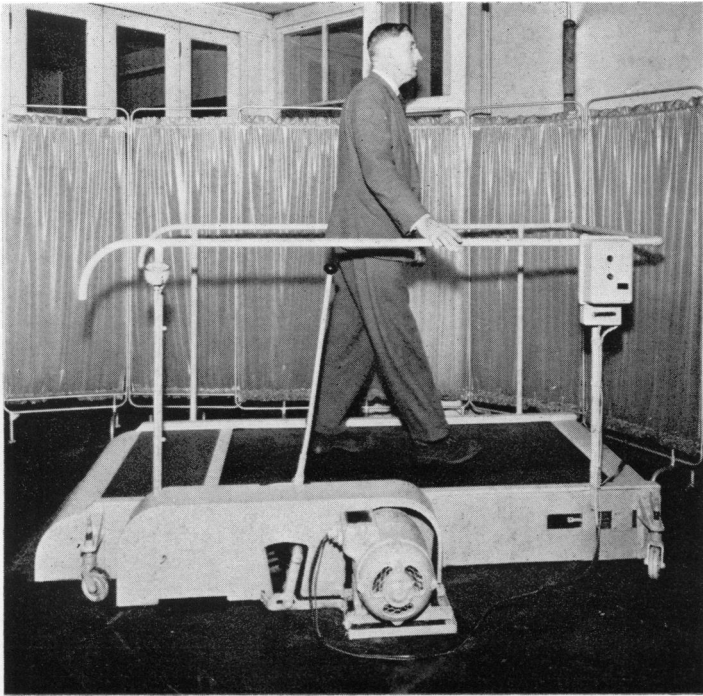


Fig. 1. Walking machine.

At his initial visit the patient's halting distance was determined on a machine designed to mimic normal walking (Fig. 1). It consists of a moving belt which slips over a platform and is driven by an electric motor through continuously variable gearing. The patient is put on the machine at a low speed and the speed is increased until it reaches what he considers to be his normal pace, which is then held. He is walked at this speed at each visit afterwards. At each visit a full limb examination was done and peripheral pulses and oscillations noted.

K. BLOOR

The patients have in the main been treated conservatively. None of them in the period of review had direct arterial surgery. The operations done were lumbar ganglionectomy, amputations and tenotomy of the tendo Achillis.

Age and sex incidence

Of the 1,476 patients, 156 (10.5 per cent.) were women and their average age at onset was 62.2 years contrasted to the male average age of 57.5 years. Table I shows the age of the patients at the onset of claudication.

TABLE I

<i>Age</i>	<i>Men</i>	<i>Women</i>
25—34	7	—
35—44	83	8
45—54	418	24
55—64	557	57
65—74	231	60
75+	24	7
TOTAL	1,320	156

Age at onset of intermittent claudication.

In view of the later age of onset and the comparative infrequency of the disease in women, it could be expected that their further history would be better than in men of the same age, but it is in fact very similar. It appears that once a woman has arteriosclerotic symptoms the feminine advantage is lost and she suffers just as badly as the men. When the figures for the women are broken down by age, the resulting groups are too small for generalization. In most of this lecture, therefore, the male patients only will be used for illustration.

Diabetes mellitus

Those with diabetes mellitus were a very small part of the total, only 4 per cent. In some of these the excretion of sugar in the urine started after the onset of claudication and therefore the proportion with diabetes in an overt form at first attendance was smaller than this. The death rate in diabetics appears to be only a little greater than in the other patients.

Review period

The 1,476 male and female patients have been followed-up in detail up to June 1957, and thus have been reviewed for four to 10 years if they survived. 660 of them were seen during the first year of symptoms, but many came only in the second or later years, and a few as long as 10 or more years after onset. As will be seen, the course of events in the first year differs from that in subsequent years, so that death rates and amputation rates have been calculated according to the year from the onset of intermittent claudication.

NATURAL HISTORY OF ARTERIOSCLEROSIS OF THE LOWER EXTREMITIES

660 were seen in their first year after onset and of these 32 died. Another 289 were seen in their second year of symptoms, giving 917 under review in that year. This increases to 1,065 in the fourth year, after which the numbers decline as the period of follow-up of the survivors comes to an end.

When I refer to the year of onset, I am referring to the onset of claudication. Some patients, however, attend with angina pectoris or a coronary or cerebral thrombosis which may have predated the leg symptoms by many years. 7.9 per cent. of patients had some central arterial lesion prior to their intermittent claudication.

Death rates

Nearly all patients with arteriosclerosis can be expected to die of their arterial disease. Of the 673 deaths which occurred, 401 (59.5 per cent.) were cardiac, 112 (16.6 per cent.) cerebral and another 55 (8.1 per cent.) directly due to vascular disease, such as aneurysmal rupture, mesenteric occlusion and so on, and only 105 (15.6 per cent.) died of other intercurrent disease.

TABLE II
ESTIMATED PERCENTAGE SURVIVAL TO 5 AND 10 YEARS IN MEN.

<i>Age</i>	<i>5 years</i>	<i>10 years</i>
35—44	91.8	77.6
45—54	79.0	54.2
55—64	72.0	34.9
65—74	60.3	22.2
75+	40.3	0

Survival rates for the men have been estimated from the death rates observed in each year and are presented in Table II. In the age group 45–54 years, the five-year survival was 79 per cent., the 10-year survival 54 per cent. This expectation diminishes with age to a 10-year survival of 22 per cent. in the age group 65–74 years.

These figures are better than expected and raise the question of how much worse this is than in the general population. The survival rates of the general male populace of the South East Lancashire area have been estimated. In the age group 45–54 years this is 93.5 per cent. at five years, compared to 79 per cent. in the arteriosclerotics.

Figure 2 shows that the survival rates of the 55–65 age group in the arteriosclerotics roughly parallels that of the general population of 65–74 years and, as a rough approximation, arteriosclerotics can be thought of as being 10 years older than they should be.

Non-fatal coronary and cerebral disease

The damage done in central arteries does not end with these fatalities. Non-fatal coronary or cerebral disease may produce angina of effort or hemiparesis. This will occur in 20 per cent. of patients at least once if they survive to five years and possibly oftener.

At the time of these non-fatal coronary occlusions there are few coincidental occlusions of other vessels. Of 224 non-fatal attacks observed, two patients had a more or less coincidental occlusion of another artery occurring suddenly and five had one in the following month. This is rather curious as coincidental occlusions might be expected for two reasons.

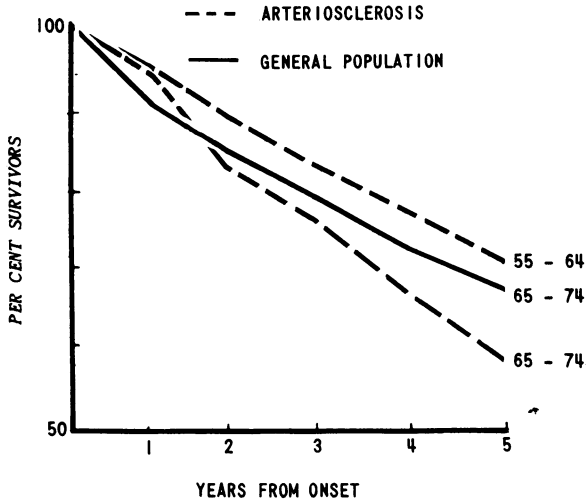


Fig. 2. Estimated survival rates of 10-year age groups of arteriosclerotics and general population.

The first is peripheral embolism. It is generally accepted that peripheral embolism is a highly fatal condition. Up to 50 per cent. of cases admitted to hospital which occur following coronary thrombosis die in hospital. But this is hardly high enough to explain the infrequency of peripheral embolism in these surviving patients and it is felt that embolism must be rather a rare condition following myocardial infarction. The second reason is theoretical. The theory is the general one, variants of which are always arising, which says that a block is produced by acute changes in some blood constituent, such as the lipids or the factors concerned in coagulation. If this is true, it should be so for the peripheral arteries as well, but these figures do not support such theories.

Prognosis in limbs

It is very noticeable in this series that although a few patients have upper limb vessel blocks, they seldom produce symptoms and no patient has

NATURAL HISTORY OF ARTERIOSCLEROSIS OF THE LOWER EXTREMITIES

lost arm or finger due to gangrene. Patients do complain sometimes of mild Raynaud's phenomena, often in a finger which has been subjected to minor injury in the past, but this seldom lasts more than two or three years.

In the lower limb a variety of events can occur. A patient may arrive at the clinic with a segmental occlusion, for example, in the popliteal artery, which may not extend immediately, and his claudication may im-



Fig. 3. Diffuse arteriosclerosis.

prove with the development of his collateral circulation. Later on he may develop a further occlusion in any site in the same leg and again he may recover or he may progress to pre-gangrene, gangrene and amputation. Another patient may develop gangrene without obvious vascular deterioration.

To present all this calls for simplification, and to do this I have referred only to the first event of a kind in any patient in working out their rates of incidence. If, for example, a patient has an additional femoral and then

K. BLOOR

a common iliac block, only the first is included in working out rates of incidence, thus putting these a little on the low side, but both events are included in the gross figures.

The patients' lesions on being first seen were as follows:

36.1 per cent. had femoral thromboses, and nearly a quarter of these were bilateral.

32.0 per cent. were popliteal and only an eighth were bilateral.

4.2 per cent. had common iliac blocks and 1.6 per cent. aortic blocks.

25.1 per cent. were thought to have grossly narrowed arteries without a complete main vessel block (Fig. 3). This lesion is usually bilateral.

Bilateral lesions imply more severe disease and they have a higher death rate than unilateral lesions in the same age group. Oddly enough, they are more frequent in the younger patients. 64.7 per cent. of the 35-44s have bilateral lesions, compared to 38.1 per cent. in the age group 55-64 and 32.2 per cent. in the age group 75+ years. This is only one example of the poorer state of the limbs of the younger patient, in spite of his longer survival.

Further thrombosis

It is quite easy to diagnose further vessel occlusion by history, clinical examination and oscillometry, if the previous state is known. This is particularly so if the vessel occluded is the common iliac or aorta, as disappearance of the femoral pulse is easy to detect.

335 patients had an addition to their vascular occlusion during the period under review. Of 901 patients who presented with lesions in one leg, 163 later had a thrombus in the other leg, and 65 had further lesions on the side first complained of. In 367 patients with narrowing only, 54 subsequently blocked a major vessel. In 208 patients with bilateral blocks on attendance 53 had a further thrombus. The frequency with which this occurs is fairly large, and more or less the same in each age group. The surviving patient has a 25 per cent. chance of having increased the occlusion in his legs at the end of five years. The chance at 10 years is about 45 per cent. Those people who had a further main vessel block in a leg previously blocked numbered 118. In only 14 (11.9 per cent.) instances did this lead to midhigh amputation.

An interesting special case is that of blocks of the common iliac and aorta. These made a total of 5.8 per cent. when first seen, but 94 more developed common iliac blocks and 21 developed aortic blocks during observation, about another 5 per cent. The usual clinical course observed is for one common iliac to block followed then by extension to the aorta with blockage of the other side.

NATURAL HISTORY OF ARTERIOSCLEROSIS OF THE LOWER EXTREMITIES

It might be expected that a common iliac thrombus above another main arterial block would inevitably lead to gangrene, but mid thigh amputation was necessary in only 8.7 per cent. of cases. This is an indication of the excellence of the collateral circulation which can develop around the ilium and across the pelvis from the common iliac of the other side. It is also an indication of the frequency with which the common femoral artery remains open, preserving the flow through the profunda femoris. After extension to the aorta, however, the loss of collaterals is too great for the limb and 50 per cent. of patients lose a limb.

Narrowing of the common iliac artery occurs and an idea of its frequency can be obtained by listening to the femoral artery in the groin, when a systolic murmur can be heard in about 40 per cent. of cases. This murmur is variable and can be changed by varying the local conditions of blood flow in some way, such as by exercising the patient or warming the leg, so that it is not entirely a reliable and constant sign of narrowing but it can be a useful diagnostic sign in some obscure cases.

Pregangrene and gangrene

Gangrene is relatively uncommon after a second major vessel block in a limb. This shows the importance of blockage of the smaller peripheral vessels such as the tibials or the digital arteries, in determining the onset of tissue death and gangrene, and in these patients multiple or extensive blocks are shown on arteriography. Without an arteriogram, these distal blocks can only be inferred, but it would be a mistake to suppose that they must occur in every case. The onset of gangrene in a limb may not be determined solely by a decrease in the blood supply to a limb. Many limbs in a stable vascular state are lost by the carelessness of the patient whilst cutting his toe nails or by his doctor in prescribing unnecessary local treatment. Minor trauma plays a large part in precipitating gangrene.

Gangrene and pregangrene are loose terms difficult to define. Gangrene usually implies the death of a volume of tissue, such as a toe or a forefoot. Since it is not possible to predict the course of minor ulceration or rest pain, any episode of rest pain and of breach of the skin accompanied by rest pain are here classified as pregangrene which may lead to gangrene and amputation.

304 episodes of pregangrene and gangrene were seen, involving 263 patients, as 41 were bilateral.

Mid thigh amputation was done 142 times, bilaterally in 21 cases, and therefore 121 patients were affected.

This is only one fifth the number of those who died. Ischaemia is a less pressing problem than death at present in these patients.

K. BLOOR

The number of ischaemic incidents varied with age (Table III), and in this the younger patients were again slightly worse off, with an average incidence in the first five years of 4.6 per cent., compared to 3.5 per cent. and 3.6 per cent. in the 45-54 and 55-64 age groups.

The number of times this led to major amputation was also proportionately greater in the younger patients, 38.4 per cent. in the 35-44 age group falling to 23 per cent. in the 45-54 age group before rising again.

Pregangrene and gangrene are commoner in the first year after onset. They were seen in 8.3 per cent. but led to amputation in only about a quarter of these. In the third year the ischaemic rate is 3.0 per cent. and about half of these are amputated, meaning that the amputation rate in each year is not greatly different. The greater incidence and greater recovery are due to the fact that the collateral circulation in the first year has not yet fully opened up and therefore the feet are less protected, but the ability to retrieve minor degrees of gangrene is also greater.

TABLE III

<i>Age</i>	<i>Pregangrene and gangrene average percentage per year in the first 5 years</i>	<i>Percentage with pre-gangrene and gangrene proceeding to midhigh amputation</i>
35-44	4.6	38.4
45-54	3.5	23.3
55-64	3.6	42.0
65-74	6.6	41.0
75+	8.4	57.0

Age and gangrene.

The rate at which midhigh amputation was done was much less than expected and was for all men an average of 1.4 per cent. in the first five years. A man surviving five years has a 7 per cent. chance of losing a leg, and if he survives to 10 years, a 12 per cent. chance.

The amputation incidence does not vary much according to the lesion found at the patient's first attendance except in one instance. This is in patients with common iliac or aortic blocks. Their amputation rate as the years pass is two and a half times greater than in the others.

Intermittent claudication

Some patients achieve a surprising degree of relief from intermittent claudication. The most astonishing seen was in a man who had an aortic thrombosis to the level of the renal vessels, demonstrated by aortography. About 18 months after he was seen he improved enough to be able to walk half a mile without any pain.

To discover the degree of recovery possible in non-diseased arteries, patients with arteries blocked by trauma, surgical or otherwise, who were

NATURAL HISTORY OF ARTERIOSCLEROSIS OF THE LOWER EXTREMITIES

seen shortly after injury and were thus relatively unselected, were reviewed. They were treated, if at all, by lumbar ganglionectomy. The arteries blocked were five popliteals, four femorals and three external iliacs, 12 in all, in people with an average age of 26. The only middle-aged patient, who was 49 years old, did not improve. Two improved very considerably and the other nine could walk half a mile without pain. One has recently taken up cross-country running, but his degree of success at this is not yet known. The time taken for major recovery was from six to nine months, but one patient seen the day after injury already had no

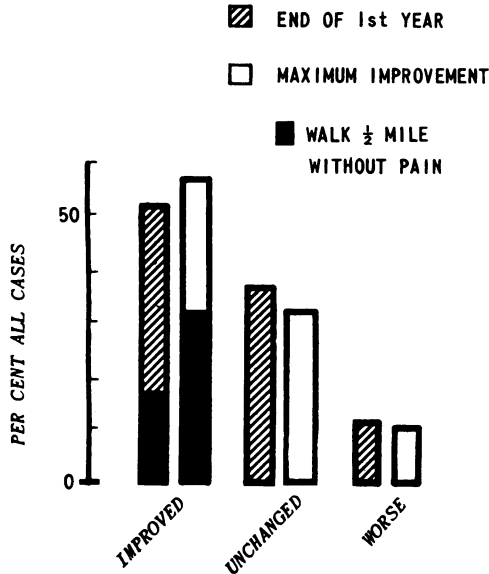


Fig. 4. Improvement in intermittent claudication, age group 45-64 years.

intermittent claudication despite division of the femoral artery. It is obvious that the leg with an undiseased collateral bed may return almost to normal function, and does so fairly quickly.

In any arteriosclerotic patient the relative amount of recovery observed will depend on the degree to which the collateral circulation was developed before he is seen, and also on whether his onset was sudden or gradual.

If the occlusion is gradual then he may begin to develop his collaterals well before symptoms appear and has less room for improvement once they do start. If a patient gives a history of sudden onset of symptoms he is more than twice as likely to improve as the patient with a gradual onset, which it is well to remember when giving a prognosis. Improvement in these patients has been seen for as long as three years after the onset.

K. BLOOR

The patients in the age range 45-64 who were seen in the first year of symptoms have been taken to illustrate the improvement to be expected. There were 363 of them, and 18 could already walk half a mile without pain when they were first seen. They were divided up according to the severity of symptoms when first seen, as it was expected that the ones who halted at a very short distance initially would prove to recover the least. It was, however, found that recovery was very similar whatever the initial distance.

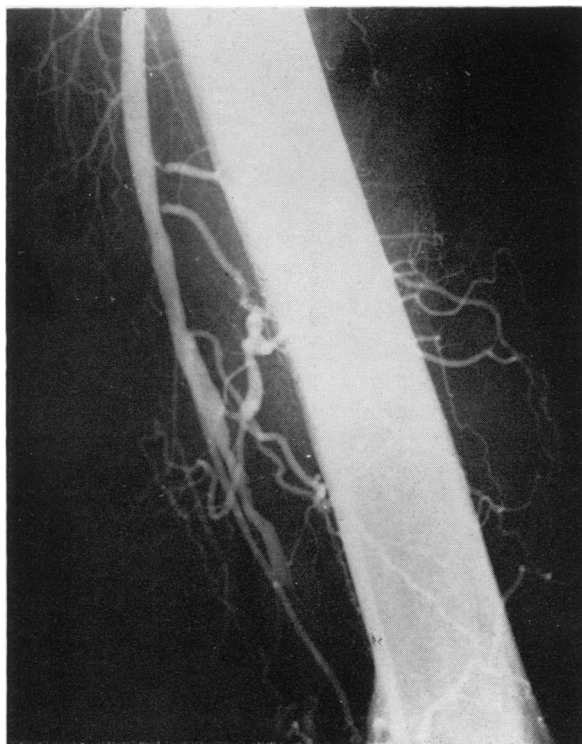


Fig. 5. Narrowing of branches of femoral artery.

Many of these did eventually have a further thrombus and therefore got worse, but their recovery up to that point was considerable.

39 (10.7 per cent.) were worse without apparent cause; 118 (32.5 per cent.) were unchanged and 206 (56.7 per cent.) improved. Improvement is defined as showing a consistent improvement of more than 100 yards in halting distance, but many did considerably better than this. 114 or 31.4 per cent. (including those 18 able to do so when first seen) were able to walk more than half a mile without halting. In this group the improvement has been maintained on average for 4.5 years until they died, had a further thrombus or ran out of follow-up.

A great deal of this improvement occurs after the first year. The state at the end of the first year compared to that ultimately achieved is seen in Figure 4. Although there is no difference in the unchanged and worse groups, the number of patients able to walk more than half a mile without pain has doubled.

This recovery is not as good as that achieved by non-diseased arteries. In part the reason for this is the habit of atheroma of gathering at the mouths of small vessels. Since these patches cannot dilate, the size of the collaterals which these vessels can form is limited at their origin. This can be seen in almost any arteriogram, as shown in Figure 5. Two of the branches of the femoral artery are so narrowed at their origin as to look completely blocked.

The prognosis for the limb can be summarized at this point. At the end of five years survivors in the 55–64 age group have a 25 per cent. chance of having a further clinically detectable thrombosis which may lead to midhigh amputation in 3 per cent. Another 4 per cent. will also have a midhigh amputation, leaving 71 per cent. From the figures just given, 56.7 per cent. of these will have improved their intermittent claudication, that is 40.3 per cent. of the whole, and roughly half of these will be able to walk half a mile without pain. It could also be put the other way round, that 59.7 per cent. will be worse or unchanged.

Lumbar ganglionectomy

To assess the influence of a single act such as lumbar ganglionectomy when superimposed upon the fluctuations of this disease is a difficult task. Any patient may experience a course which if expressed graphically would resemble the ups and downs of a scenic railway, ending at a lower level than the starting point, but it does not have the predictability of this physical model. To estimate the effect of lumbar ganglionectomy therefore demands a large control group, but comparison may still be inaccurate, as it is always possible that the patients operated on may have been worse or not improving as much as expected, and not strictly comparable with the others.

Opinion has differed on the effectiveness of lumbar ganglionectomy (Telford and Simmons, 1946; Mavor, 1955; De Takats, 1958), and the most persuasive in recent years in its favour is by Smithwick (1957). The results from the Vascular Clinic at Manchester Royal Infirmary were recently given in a review (Boyd and Bloor, 1959), but no attempt was made to give a comparison with controls.

278 patients in the age group 45–64 years had lumbar ganglionectomy in the review period. 273 were bilateral; this was done even when the disease appeared to be predominantly unilateral. There were two post-operative deaths, a mortality of 0.7 per cent. In addition there were six

post-operative extensions of thrombus in the legs, four coronary thromboses and two cerebral thromboses, an arterial morbidity of 4.3 per cent. The subsequent death rate of these patients is lower than that in patients not operated upon, which goes to demonstrate our success in choosing the fitter patients for operation.

The results will vary with the time at which it was done and the motive for doing it.

When done in patients who were getting worse, no improvement was seen in any and some continued to get worse.

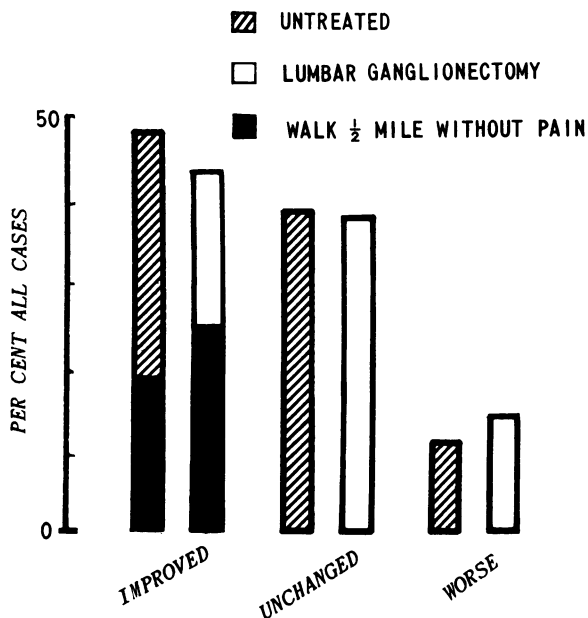


Fig. 6. Maximum improvement after lumbar ganglionectomy compared with those not operated upon, age group 45-64 years.

74 patients were operated on more than a year after onset. They may have been fairly static and were certainly not getting worse at the time of operation. It would be difficult to find exactly matched controls for these, for age and stage and date in the disease, and it is felt that a large element of bias would certainly appear during selection if attempted.

23 improved and 10 could ultimately walk more than half a mile without pain. Nine were worse. Thus 31 per cent. improved and 69 per cent. were unchanged or worse. These figures are not very impressive, either as a return for effort on the part of the surgeon and the patients, or as an indication of the therapeutic efficiency of lumbar ganglionectomy.

NATURAL HISTORY OF ARTERIOSCLEROSIS OF THE LOWER EXTREMITIES

The last group considered contains the patients aged 45–64 years, operated upon in their first year of symptoms. They were done towards the end of the first year, nearly all in the last three months. They are a selected group, worse than the general run of patients, as is obvious when looking at their walking distance at the end of the first year. None can walk more than half a mile without pain. They can be compared with the patients in the same age group who were unable to walk more than half a mile without pain at the end of the first year.

42 patients had lumbar ganglionectomy and the controls numbered 262 (Fig. 6). 48.2 per cent. of the non-sympathectomized improved and 45.1 per cent. of those operated on. The proportion able to walk half a mile without pain was 26.1 per cent. and 18 per cent. respectively. Those sympathectomized were slightly younger on average and were generally fitter than the others. They should therefore have had better results. It is felt, therefore, that lumbar ganglionectomy has not been shown to improve claudication.

Lumbar ganglionectomy and further thrombosis

It has been stated by Smithwick (1957) that one of the great benefits of the operation is that it prevents the development of further occlusion in the legs. Since nearly all the sympathectomies were bilateral comparison is possible with events in both legs in those not operated on. 65 of 278 patients operated upon had a further occlusion after operation. When this is reduced to a rate per year the incidence in either leg is 4.4 per cent. per year in the first five years after onset, compared with 5.1 per cent. in the non-sympathectomized. Since again the better general condition of the patients operated upon must be remembered, there is no difference in the results, and no advantage in sympathectomy.

Lumbar ganglionectomy and gangrene

Lastly, is lumbar ganglionectomy worth doing for pregangrene and gangrene? It must be understood that this has not been done in this series for patients with massive gangrene, but for those with pregangrene as defined above and those, difficult to define, with what can be called minor gangrene, that is with a small amount of ulceration or necrosis combined with a fairly good blood supply. In this group 34 per cent. came to mid-thigh amputation shortly afterwards.

In the 45–64 age group those with pregangrene and gangrene not treated by sympathectomy had an incidence of midthigh amputation of 35.2 per cent. Whilst these number amongst them the milder cases, they will also include those to have progressed too far to recovery by ganglionectomy.

There is thus virtually no difference between them, and it is difficult to claim any improvement from ganglionectomy.

It would be idle to suggest that lumbar ganglionectomy produces no clinical effect. It is common experience that lumbar ganglionectomy does immediately improve some minor ulceration and gangrene, but it is doubtful whether even in these circumstances it can ever be said to have saved a limb. In the past lumbar ganglionectomy has certainly been done too frequently. It has been argued that the warm feet it gives are sufficient benefit in themselves, and certainly many patients say so, but a combined mortality and morbidity of 5 per cent. is surely too high a price to pay for this effect. The use of lumbar ganglionectomy in this condition should be restricted to the rapid alleviation of pregangrenous symptoms.

Arterial surgery

Evaluation of the results of arterial surgery must await more detailed reports of follow-up but some generalizations can be made now. Consider the surgeon with 100 patients aged 55–64 seen in their first year whose intermittent claudication he has successfully treated, the method used being at the moment immaterial. In the next five years 28 will die and about 20 will have a coronary or cerebral thrombosis, leaving 57 hale and hearty. 25 more will have a further thrombus meaning another operation or a recurrence of intermittent claudication. There will be at the end of five years 42 patients with unsullied benefit. If the same sum is done for the 45–54 age group, at this point there remains 48 patients, not very different from the above, and for the 34–44 age group 63.

Now to consider the results of the operations themselves. At present it would appear that the failure rate for artery grafts to the femoral and popliteal arteries is 50 per cent. or more in the first five years (Szilagyi *et al.*, 1956; Luke, 1958; Wylie and Gardener, 1955). In fact if it is taken as 50 per cent. this is being overkind to the operation. This will leave the surgeon with roughly 21 people still benefiting at the end of five years.

For aortic and common iliac lesions the picture is different. With a high immediate success rate and a failure rate which may be as low as 20 per cent. one would have 35 happy patients at the end of 5 years. When the additional risks of gangrene to these patients are considered, it is felt that all patients with a high arterial block should have direct surgery unless they have minimal symptoms. Surgery to arteries below the inguinal ligament is not worth while with present techniques if it is being done solely for intermittent claudication, unless this is causing considerable social embarrassment. Even in a young man a tenotomy of the tendo Achillis would be preferred if indicated (Boyd and Bloor, 1960) rather than an artery graft.

On the use of direct surgery to save limbs from amputation, little can be said at present. Published results are few and undetailed. Since these operations will usually be done for multiple blocks, relief of intermittent

claudication may not be a by-product of a successful operation. The high spontaneous recovery rate of pregangrene must also be remembered, particularly in the first year when it is 75 per cent. There is no reason for the surgeon to suppose that if he has successfully grafted a pregangrenous leg he has saved a limb, and the further survival of the graft may be doubtful.

It is to be hoped that technical achievements will allow the surgeon to extend his influence on this disease. More arteries, such as the renal and internal carotids, are coming to be of interest. However, the outstanding problem is that of death from coronary occlusion, and it is hoped that the future lecturer on this subject will be as much concerned with this as with the limbs, always remembering that if patients' lives are saved there will be many more limbs also needing preservation.

Summary

1,476 patients presenting with intermittent claudication due to arteriosclerosis have been followed up for from four to 10 years.

Death rates, the incidence of non-fatal coronary and cerebral disease, of gangrene and amputation are given.

Mortality and amputation rates are less than was expected.

Further limb vessel occlusions occurred in 20 per cent. of survivors in the first five years after the onset.

Common iliac and aortic occlusions carried a worse prognosis for amputation than other lesions.

Intermittent claudication, before further occlusion occurred, improved considerably in 59.6 per cent. and some improvement was seen up to three years after onset.

Lumbar ganglionectomy was not found to influence intermittent claudication, the rate of further thrombosis or the incidence of amputation in pregangrene and gangrene.

In considering the results of surgery, the central effects of the disease overshadow the peripheral ones and favourable five-year results are small because of this. It is suggested that arterial surgery is only generally applicable to the aorta and common iliac vessels at present.

ACKNOWLEDGMENTS

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K. BLOOR

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ADMISSION TO THE COURT OF PATRONS

AT THE MEETING of the Council on 8th December, Lord Kindersley, the Chairman of the Appeal Committee, was admitted to the Court of Patrons.

A citation in honour of Lord Kindersley was given by Professor Sir James Paterson Ross, Bt., who spoke thus:

“ Mr. President: It would be out of place as it is unnecessary for me formally to introduce Lord Kindersley to this Council for he is already a well-known and highly valued member of our community. He is, however, especially welcome today because we are all anxious to give expression to our feelings of appreciation and gratitude for the notable part he is playing in the life and activity of the College.

“ It is only when we are called upon to serve on Hospital Governing bodies and Committees of Management that we become aware of the importance of the part played by laymen on these bodies; and the same applies in this College to the debt we owe to our lay friends for their help on the Finance and Appeal Committees and on the Committee of Management of the Institute of Basic Medical Sciences. Among these friends Lord Kindersley is *primus inter pares*, and those of us who have seen him in action can testify to the great benefits we derive from his shrewd judgment, his wise counsel and his inspiring leadership. For my own part I will never forget the comfort which his advice and support gave me when my actions were being criticised in the lay and medical press.

“ Like most of the laymen who help us in our professional affairs Lord Kindersley is fully occupied already and it is hard to understand how he can find the time to work for us in the College at our meetings, and especially outside the College by influencing people on our behalf. His many activities in the City are in fact of great value to us because he has come to know personally so many influential people whom he has kindly approached in our interest—but that has meant hours and hours of solid work for which we are deeply grateful.

“ It has been a privilege to become acquainted also with Lord Kindersley’s family and those of us who were present on that very special occasion when he was admitted to the Honorary Fellowship will never forget meeting that wonderful old lady, his mother. This intimate note reminds us that it was Archie McIndoe who introduced Lord Kindersley to the College.

“ It must be clear to everyone that Lord Kindersley’s personal substantial support and continuing interest in our affairs entitle him to membership of the Court of Patrons and it is my privilege, Mr. President, on behalf of the Council to ask you now to admit him.”