LUMBO-DORSAL SYMPATHECTOMY IN SEVERE HYPERTENSION

AN INTERIM SURVEY

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[WITH PHOTOGRAPHIC PLATE]

The treatment of hypertension by resection of the dorso-lumbar sympathetic nervous system has been practised for many years in the United States, where there is already an extensive literature on the subject. This literature has been reviewed elsewhere (Blodgett and Cutler, 1947; Bassett, 1948). It is only recently, however, that this treatment has attracted any great interest in this country. It might be helpful, therefore, to review a series of consecutive cases operated on at Westminster Hospital. The number—24 cases—is not large, and any conclusions can be only of a tentative nature. However, all these cases had been fully investigated before operation and have been carefully observed since, and an idea of the value of this form of treatment has begun to emerge.

Analysis of Material.—Of the 24 patients 15 were men, and of the nine women seven were married and two single. The youngest patient was a girl of 17, and the oldest a man of 60. The average age of the group was 42 years. There was no appreciable difference in age at operation between the men and the women. Six of the patients were over 50. The age incidence in decades was as follows: Under 20 years, 1 case; 20–29, 2 cases; 30–39, 4 cases; 40–49, 11 cases; 50–59, 5 cases; 60 years, 1 case.

Diagnosis

In five cases there seemed to be a cause for the hypertension: three patients had chronic nephritis, one patient had calculi in both kidneys, and the fifth, a married woman aged 47, had suffered from eclampsia 28 years previously. One patient with renal hypertension, a man aged 53 who had a clear history of acute nephritis at the age of 23, stated that his father and brother had both died from a "stroke." In this case the chronic nephritis had entered a malignant phase, and the familial tendency to high blood pressure had probably accentuated the disease. In the other 19 cases, in spite of careful interrogation and investigation, the origin of the hypertension was obscure, except that nine had a family history of hypertensive cardiovascular disease, suggesting that they might be cases of essential hypertension. However, when the records of these 19 patients were viewed as a whole an impression was gained that many were cases of chronic renal disease rather than essential hypertension.

Malignant Hypertension.—There were six cases of malignant hypertension in this series—four primary and two

secondary. The following criteria were used in making the diagnosis: (1) The presence of papilloedema with or without oedema of the surrounding retina—all six cases; (2) necrosis of the glomeruli or afferent arterioles on renal biopsy or at necropsy—five cases; (3) gross impairment of renal function—three cases; and (4) cerebrospinal fluid pressure greater than 300 mm. of water—two cases. Malignant hypertension may be a primary disease in a previously healthy person, or it may be secondarily superimposed on an existing renal disease. It is useful to make this distinction, as the primary cases have a prospect of greater and more permanent relief by operation. In one other case of renal hypertension the presence of a malignant phase was in doubt:

A married woman aged 50, who had suffered from severe occipital headaches for two years, had a blood pressure which varied between 180/120 and 300/170 mm. Hg, but was usually in the region of 240/150. Retinal examination revealed severe vascular sclerosis with occlusion of the right superior temporal artery. There was considerable retinal oedema, with many haemorrhages but only a few exudates and no papilloedema. The blood urea was 24 mg. per 100 ml. and the urea clearance 48% of normal. The cerebrospinal fluid pressure was 230 mm. of water. Pyelography revealed calculi embedded in both kidneys. Renal biopsy performed at operation showed necrotic changes in the afferent arterioles.

Symptoms

All patients had symptoms referable directly or indirectly to their raised blood pressure. Headache, often accompanied by severe lassitude, was the commonest. Only two patients did not complain of it, and in 13 it was the presenting symptom. Eleven patients had visual disturbances. Four had suffered from encephalopathic attacks before operation—an index of the severity of the hypertension in this series. Three patients had cardiac dyspnoea—paroxysmal in one and on exertion in the other two. Only three patients had prior knowledge (15, 14, and four years respectively) of their raised blood pressure. In all the other cases hypertension was a recent discovery.

Physical Findings

Blood Pressure.—In all patients the blood pressure was recorded on several occasions before operation. It was confirmed that the diastolic pressure gave a better indication of the severity of the hypertension. In only three patients

was the diastolic pressure constantly below 130 mm. Hg. The systolic pressure varied widely from day to day, sometimes by as much as 60–70 mm. Hg, but it was below 200 mm. Hg in only one patient. With rest in bed, most patients showed some fall in blood pressure, as shown by the accompanying table.

Blood Pressure (mm. Hg)	On Admission	With Bed Rest
Systolic:		
180–199	1 patient	7 patients
200–219	4 patients	4 "
220–239	6 "	7 "
240–259	8 "	6 "
260–279	4 "	—
280	1 patient	—
Diastolic:		
110–129	3 patients	10 patients
130–149	9 "	7 "
150–169	9 "	7 "
170–189	3 "	—

The effect of sedatives was investigated in five cases. "Sodium amytal," 3 gr. (0.2 g.), was given three times at hourly intervals, and the blood pressure was recorded at hourly intervals thereafter. The diastolic pressure fell below 90 mm. Hg in three of the five cases. The experience has not been large enough to estimate the usefulness of the test in selecting patients for operation.

Fundal Appearances.—The retinae were abnormal in all 24 patients—the six cases of malignant hypertension had papilloedema; 13 patients had haemorrhages and exudates, usually with retinal oedema, as well as arterial sclerosis; and five had arterial changes only; two of the latter had hypertensive heart disease, and one, a woman aged 52, was blind in one eye from an occlusion of the central retinal artery 16 years previously. Her blood pressure had been recorded as normal at the eye hospital she attended at that time.

Cardiac State.—This was assessed clinically, radiologically, and by electrocardiogram in all cases. Hypertensive heart disease was regarded as present when there was considerable cardiac enlargement and a grossly abnormal electrocardiogram. Four patients were considered to have this condition. Minor degrees of cardiac enlargement, usually observed radiologically, and minor electrocardiographic changes, such as diphasic or early inversion of T waves, were not considered indicative of this state. Congestive heart failure was not present in any of these four patients, but two had increasing breathlessness on exertion and one had frequent attacks of paroxysmal dyspnoea with blood-stained sputum and radiological pulmonary engorgement. The other patient, a woman aged 49, had no cardiac symptoms before operation, but one month afterwards developed congestive failure, from which she died four months later.

Renal Function.—The blood urea and the van Slyke urea-clearance tests were estimated in every case. The specific gravity of the urine was recorded daily, and often by depriving the patient of fluids for 12 hours in order to obtain the maximum urine concentration. Seven patients had a blood urea greater than 40 mg. per 100 ml., and five had a urea clearance of less than 70% of normal. Both tests were abnormal in three of the patients with malignant hypertension. The intravenous pyelogram was normal in 19 patients. One other had compensatory enlargement of the left kidney, and another had calculi in the lower calices of both kidneys. Excretion of the dye was poor in two of the patients with malignant hypertension. A retrograde pyelogram was normal in one patient with an equivocal intravenous test. A portion of renal cortex was removed at operation for histological examination on 12 occasions.

Although the appearance was abnormal in every case, and on the whole consistent with the clinical and pathological findings, not enough experience of this procedure has been acquired for an opinion to be given on its value.

Lumbar Puncture.—This was performed on 12 patients before operation. In nine the cerebrospinal fluid pressure was greater than 170 mm. of water, and greater than 300 mm. in two of the patients with malignant hypertension.

This series therefore consists of comparatively youthful patients suffering from severe hypertension. There is little that medical treatment alone can offer such patients, and the prognosis is always doubtful and often grave. As in addition symptoms were severe enough to interfere with their work and daily lives, it was felt that operation was justified.

Operation

The operative procedure in all cases was that of Smithwick and need not be elaborated, the coeliac ganglia, splanchnic nerves, and sympathetic chain being removed. The chain was excised in varying lengths, but never less than from the ninth dorsal to the first lumbar inclusive. The operation differs from that of other reported methods in that the coeliac ganglia were always excised. The amount of post-operative back pain could be diminished by resecting the twelfth (subcostal) nerve as fully as possible. All cases are now drained, owing to the difficulty in distinguishing between deep haemorrhage and post-operative hypotensive reaction, which undoubtedly caused the two deaths after operation. A blood transfusion was given only if there was appreciable haemorrhage from the drainage-tube.

Complications.—Two patients died as a direct result of operation, both from haemorrhage within 24 hours. A liability to haemorrhage due to increased capillary fragility is well known in severe hypertension. A pronounced fall in systolic pressure, with narrowing of the pulse pressure, is a usual accompaniment of this operation, and as a result immediate post-operative haemorrhage is difficult to detect. There is considerable loss, too, of the usual autonomic response to haemorrhage, and profound shock quickly develops. Three patients had post-operative complications severe enough to delay convalescence—two had an empyema and the other developed a massive pleural effusion, which responded well to repeated aspiration.

In 11 cases the following minor complications occurred: pneumonia and atelectasis, 3; pneumothorax, 2; haematoma formation, 2; pleural effusion, 1; infection of wound, 1; paroxysm of auricular fibrillation lasting for two hours, 1; bulging of the abdominal wall due to section of the eleventh and twelfth intercostal nerves during operation, 1.

Mortality

In addition to the two post-operative deaths, three other patients have since died—in two cases two months and in one case five months after operation. All three were seen in the early stages of this investigation and were considered at the time to be gravely ill; they would not now be submitted to operation. Renal function was poor, and at necropsy the typical changes of malignant hypertension were found. Two died from uraemia and one from congestive heart failure, and operation appeared to have no effect on the progress of their disease.

Results of Operation

In one of the remaining 19 cases the operation remained incomplete because of an empyema which developed after the first stage. The other 18 have been observed for varying periods: over 18 months, 1 case; 12–18 months, 7 cases; 6–12 months, 9 cases; and 5 months, 1 case.

Effect on the Blood Pressure

This has been disappointing. After a temporary fall for a week or two the blood pressure starts to rise again and within three months has returned to the neighbourhood of the pre-operative figure. In only five of the 18 cases has the fall in blood pressure been appreciable, but even in these the final figure is well above normal.

No striking blood-pressure changes with alteration of posture have been observed. Only three patients have reported dizziness on standing up, and this was transitory. There was some fall in blood pressure in most cases immediately on standing up from the recumbent position, but this was no greater than could be accounted for by the lability of blood pressure in the hypertensive patient.

This failure to produce permanent lowering of blood pressure suggests that the effect of operation can at most be palliative.

Retinal Change

The improvement in the appearance of the fundus oculi has been as rapid and dramatic as that reported elsewhere (Bourne *et al.*, 1948). Retinal oedema, haemorrhages, and exudates have with one exception disappeared, and so far have not returned. This improvement is useful for purposes of record, and it may also represent a diminution in the rate of progress of the disease. It is felt, however, that there has been a tendency to lay undue stress on this fundal improvement, and a word of caution is necessary. The grading of retinal change suggested by Wagener and Keith (1939) is useful as a guide to severity, but its limitations should be appreciated.

In benign essential hypertension, the presence of retinal changes probably indicates a tendency to cerebral vascular incidents (Foster Moore, 1916-17), but not to heart failure or coronary artery disease. Also, many cases of benign hypertension have occasional exudates and haemorrhages which appear and reabsorb spontaneously over a period of years. Thrombosis of the retinal veins, too, may produce a startling fundus appearance without necessarily any worsening of outlook for the patient. Again, although exudates and haemorrhages cleared from the retinae of these patients, it was noteworthy that the vessels themselves showed little alteration even when only spasm was observed. Lastly, hypertensive retinopathy is commonly symptomless, and visual impairment slight unless papilloedema is present, or unless the patient is unlucky enough to have a patch of exudate or a haemorrhage over the macula or a thrombosis of one of the vessels, and consequently the improvement in fundal appearance is of less interest to the patient than to the observer. Therefore it is felt that this improvement should be regarded with caution.

Cardiovascular State

Perhaps the most urgently required information concerns the effect of this operation in hypertensive heart disease. Is there any prospect of improvement here as in the fundus oculi, or will the heart be as little affected as the blood pressure? Unfortunately this series is too small to provide an adequate answer, there being only four cases of hypertensive heart disease. Their case records are as follows.

Case 1.—A blacksmith aged 30 had suffered from attacks of paroxysmal breathlessness, occasionally associated with blood-stained sputum, for a month before his admission to Westminster Hospital in April, 1947. Apart from a similar isolated attack in August, 1946, his previous health had been good. His father had died from the effects of high blood pressure.

His physique was good, but the heart was enlarged, and radio-scopic revealed pulmonary engorgement. Pulsus alternans, gallop rhythm, and rales at the lung bases were observed for

48 hours after admission, but there was no congestive failure. The blood pressure was 235/135 mm. Hg, falling to 180/120 mm. Hg with rest in bed. There was a sharp inversion of the T waves in lead I and left axis deviation in the electrocardiogram. The retinal arteries were thickened, and many exudates and a few haemorrhages were present. Renal function was normal.

Immediately after lumbo-dorsal sympathectomy in April-May, 1947, the blood pressure fell to 135/85 mm. Hg, but three weeks later it rose to 160/110. Two months later he was well, had gained 12 lb. (5.44 kg.) in weight, and not only had the heart decreased considerably in size and the lungs cleared radiologically, but the T waves in lead I were large and upright and the retinal exudates had disappeared.

Eighteen months after operation there had been no further breathless attacks, and he had been working continuously as a carpenter. He was slightly breathless on exertion, probably due mainly to obesity, as his weight had increased from 8 st. 12 lb. (56.25 kg.) at the time of operation to 11 st. 9 lb. (73.94 kg.). The blood pressure was 210/165 mm. Hg, and the retinae were normal apart from arterial changes. The lung fields were clear radiologically, but there was moderate enlargement of the left ventricle. The T waves were diphasic in lead I but negative in CR₇. (For chest films see special plate, Figs. 1, 2, and 3. Electrocardiograms of this case are shown in Figs. A, B, and C.)

FIG. A.—Case 1. Hypertensive heart disease. Electrocardiogram lead I before lumbo-dorsal sympathectomy. T wave sharply inverted.

FIG. B.—Case 1. Hypertensive heart disease. Electrocardiogram lead I two months after lumbo-dorsal sympathectomy. T wave now upright.

FIG. C.—Case 1. Hypertensive heart disease. Electrocardiogram lead I eighteen months after lumbo-dorsal sympathectomy. T wave now diphasic.

This patient appeared to derive considerable benefit from operation, although the heart is now enlarging again and the fall in blood pressure was only transitory.

Case 2.—A gatekeeper aged 42 had suffered from high blood pressure with persistent early morning headaches for five years, breathlessness on exertion and dizziness for four years, and for two months had felt very tired and unwell. The blood pressure was 230/150 mm. Hg, with persistent pulsus alternans, and the heart was considerably enlarged. The T waves in leads I, II, and CR₄ were inverted, with left axis deviation reversible by inspiration. Lumbo-dorsal sympathectomy was performed in May, 1948. Headache and dizziness ceased at once, and the

breathlessness slowly improved. Seven months after operation he was working, was feeling well, and became only slightly breathless on moderate exertion. His weight had increased from 9 st. 6 lb. to 11 st. 4 lb. (59.87 to 71.67 kg.). The heart size, however, was unaltered, and the blood pressure was 205/140 mm. Hg, although pulsus alternans had not been observed since two months after operation. In September the electrocardiogram showed that left axis deviation had disappeared and TCR₁ was upright, but T was still negative in the other leads.

Here objective improvement has not been striking, although subjectively the patient is much better, and for this reason it is felt the operation was worth while.

Case 3.—A married woman aged 47 had suffered from eclampsia 28 years previously. She had intermittent headaches for many years, and for five months had been breathless on exertion. There was no family history of high blood pressure. She was obese and there was moderate cardiac enlargement; the blood pressure was 230/150 mm. Hg. The electrocardiogram showed left bundle-branch block, and there were retinal arterial changes. Renal function was normal. A month after sympathectomy in December, 1947, the blood pressure was 145/90 mm. Hg, but a year later the figure was 240/140. Her heart, however, had not increased in size, and her breathlessness appeared to be mainly due to her obesity, as she had gained 9 lb. (4.08 kg.) in weight. Left bundle-branch block was still present.

Case 4.—A married woman aged 49 had suffered from high blood pressure for 19 months, associated with headaches, which ceased for three months with sedative treatment and then recurred. For a month she had blurring of vision in both eyes. The blood pressure was 220/160 mm. Hg, the heart was enlarged, and the lungs were engorged radiologically. T₁ was diphasic, the ST segments were depressed, and left axis deviation was present in the electrocardiogram. Sympathectomy was performed in May, 1948, but the blood pressure fell only to 180/140 mm. Hg. A month later she suddenly developed rapidly progressive congestive heart failure, from which she died in October, 1948. The post-mortem findings were those of congestive heart failure with malignant hypertension.

Malignant Hypertension

Four of the six patients with malignant hypertension are now dead. One died as a result of operation, two from uraemia two months later, and one from heart failure five months later. These last three patients stood the operation well, but the course of the disease was not delayed. The two survivors, both women, are now well and have shown considerable improvement. Their case histories are as follows.

Case 5.—A married woman aged 57 had for a month suffered from severe headaches, worse on stooping, with mistiness of vision. Both eyes showed gross papilloedema, with extensive haemorrhages and a few exudates around the disks (Plate, Fig. 4). The blood pressure was 270/140 mm. Hg, and the cerebrospinal fluid pressure was greater than 300 mm. of water. Radiological films of the skull, the electro-encephalogram, heart, and renal tract were all normal. Sympathectomy in March–April, 1948, only slightly lowered the blood pressure, but the papilloedema, retinal haemorrhages, and exudates rapidly disappeared (Plate, Fig. 5). The headaches also ceased, and seven months later she was well, although the blood pressure was still 260/140 mm. Hg.

Case 6.—A girl aged 17 complained of early morning headache, often associated with vomiting, for two years. Apart from transient mistiness of the left eye in August, 1947, her health had always been good. The blood pressure was 260/180 mm. Hg. There was moderate albuminuria, but no casts were seen, and the blood urea was 39 mg. per 100 ml. Mr. E. F. King reported on the retinae (Plate, Fig. 6): "There is retinal oedema particularly of the optic nerve heads and areas immediately adjacent. There is gross retinal exudate round the optic disks, and scattered exudates throughout the fundi, but only a few haemorrhages. Attenuation of the arteries and congestion of the veins is pronounced."

Renal biopsy performed at sympathectomy in March, 1948, showed the necrotic changes of malignant hypertension. Nine months later she felt well, had no headache, and her weight had increased from 8 st. 1 lb. (51.26 kg.) at the time of operation to 10 st. 12 lb. (68.95 kg.). The blood pressure was 180/120 mm. Hg. The vision in the left eye was poor (hand movements only), but good in the right eye. Mr. King reported: "Both fundi, left much more than right, show consecutive optic atrophy. There is extreme attenuation of the arteries, some in the left eye being completely occluded, and widespread retinal degeneration and some old retinal exudates. There are no recent haemorrhages and exudates" (Plate, Fig. 7).

In Case 6 the result has been particularly satisfactory, as the blood pressure has been significantly lowered, the malignant phase being replaced by a relatively benign hypertension. The fundal appearance, too, has considerably improved, although there is impaired vision due to consecutive optic atrophy.

General Health

Undoubtedly one of the most impressive features of this operation is the general improvement in health it causes. Headache, lassitude, and vertigo disappear, and the patients quickly acquire new energy. Most patients have returned to work, and often they must be deterred from working too hard. A significant gain in weight was noticed in 13 patients—sometimes of more than 2 st. (12.7 kg.)—and obesity has occasionally called for dietetic restriction. Only one patient, obese before operation, lost weight afterwards.

Discussion

Lumbo-dorsal sympathectomy has been performed in 24 cases of severe hypertension, 18 of which have been observed for varying periods up to 18 months. The high blood pressure has remained virtually unaltered, and for this reason the operation is expected to be only palliative. In spite of this, however, general health and vigour are improved, headache and lassitude have disappeared, and weight has been gained. Occasionally the heart may decrease in size and the electrocardiogram improve if hypertensive heart disease was not too severe before operation. Even if this does not occur, breathlessness on exertion may diminish and cardiac asthma disappear.

There is as yet little information to indicate which cases of hypertensive heart disease will benefit most by operation or how long improvement will last, and the experience from the four cases recorded here is too small to give a clear guide. It is felt, however, that auricular fibrillation, congestive heart failure, past or present, and evidence of coronary artery disease are contraindications to operation. Patients with considerable cardiac enlargement, persistent pulsus alternans, gallop rhythm, or gross electrocardiographic changes are unlikely to improve, and should be submitted to operation only when other strong indications are present. The following patient was refused operation on account of his cardiovascular state:

Case 7.—A man aged 48 had known of his high blood pressure and enlarged heart for five years. For two years before his admission to Westminster Hospital in February, 1947, he had suffered from intermittent headache, momentary double vision, and gradually increasing intermittent claudication. The blood pressure was 220/130 mm. Hg, with pulsus alternans. The heart was enlarged, and gallop rhythm was present. The retinal vessels showed arterial sclerosis, and no pulsation could be felt in the arteries of the feet. The blood urea was 36 mg. per 100 ml.

Rest in bed brought temporary improvement, but his headache recurred on discharge from hospital, and he became short of breath on slight exertion. In May, 1947, he developed a left hemiplegia. In May, 1948, the sudden onset of auricular fibrillation caused acute congestive failure, which responded well to treatment in another hospital. When seen in August, 1948,

there was considerable cardiac enlargement and auricular fibrillation. The liver margin was just palpable, with slight neck-vein engorgement but no oedema. The hemiplegia was unaltered. The blood pressure was 180/80 mm. Hg. His condition was considered to have advanced beyond the stage where sympathectomy was practicable.

It is considered that operation should be limited to relatively young people, as permanent arteriosclerotic changes are less likely to have occurred. Moreover, the disease generally progresses more rapidly in the young and intervention is more necessary. However, an upper age limit has not been adhered to rigidly, although any patient over the age of 50 requires special scrutiny. Each case should be viewed on its merits, and age should contraindicate operation only when permanent vascular disease is present, which with even merely a temporary lowering of blood pressure would make arterial thrombosis a serious hazard.

Malignant hypertension is not in itself a bar to operation. In fact, when the disease is primary it is especially indicated provided renal function has not seriously deteriorated. Two of the six patients in this series, both primary cases, are alive and have improved considerably. Operation seems to have "broken the vicious circle," and the malignant phase for the time being has abated. The prospect of relief of even a few cases of this grave condition is distinctly promising. In three of the fatal cases the patients were severely ill and had poor renal function, so their failure to respond caused little surprise. It must be emphasized that patients with poor renal function should not be submitted to operation. The blood urea should be less than 60 mg. per 100 ml. and the urea clearance greater than 50% of normal. It is doubtful if the operation is ever justified where the blood urea is greater than 80 mg. per 100 ml.

Operation may be performed in cases of hypertension secondary to some irremovable cause. There were three cases of chronic nephritis in this series, and some others may have had nephritis of the repens type, although there was no direct evidence of this. If the renal function is satisfactory progress of the disease may be slowed by operation.

Lumbo-dorsal sympathectomy then seems beneficial to young patients with severe hypertension who have severe symptoms, no substantial arteriosclerosis or gross heart disease, and good renal function. Such patients represent only a minority of all cases of hypertension, and operation will afford only partial relief. There is, however, considerable relief of symptoms, and the tempo of the disease appears to be slowed. Complete relief could hardly be expected seeing that the kidney remains uninfluenced, and for this reason it is felt that more extensive resections of the sympathetic nervous system, involving more than two operations with their additional hazards, are unjustified.

The advisability of operating on early cases of hypertension before the heart and other organs are affected may be considered. Should not hypertension in its larval stages be sought, as early cancer is sought, for surgical treatment? Such reasoning is fallacious, as the problems of cancer are dissimilar from those of persistent hypertension. Moreover, pathological change in response to raised blood pressure varies widely from case to case, although hypertension starting in youth usually has a graver prognosis than that beginning in later life. Nor can one tell whether a young patient with mild hypertension will go rapidly downhill or will lead a useful life for 10, 20, or more years. This being so, a surgical procedure involving two major operations in a patient who is virtually well is unjustifiable, particularly when the operation is not curative, and its late effects are

uncertain. For this reason operation was not advised in either of the two following cases.

Case 8.—A locomotive fireman, aged 27, for four years had attacks of momentary dizziness in which he did not fall. He had been under observation for two years, during which time his blood-pressure range was 200–170 mm. Hg systolic and 130–115 mm. Hg diastolic, except twice when figures of 140/95 and 130/80 mm. Hg had been obtained. His family history was healthy and his previous health good.

On admission to Westminster Hospital in May, 1948, he was rather apprehensive, and the blood pressure was 200/120 mm. Hg, but a daily record showed a consistently high figure. The cardiovascular system was otherwise normal. The urine was normal and he could concentrate to a specific gravity of 1030. The retinal arteries showed spasm in some segments but no exudates or haemorrhages. On sedation with sodium amytal the lowest blood pressure recorded was 130/95 mm. Hg.

Since then his blood pressure has remained consistently high, and he is considered to have essential hypertension, although he admits that "his nerves quicken every time he has his blood pressure taken." His dizzy attacks have ceased spontaneously, and his condition is not considered serious enough to warrant sympathectomy at present.

Case 9.—A married woman had in April, 1942, when aged 22, suffered for six months from high blood pressure with morning headache, nausea, and blurring of vision in the right eye. On examination the blood pressure varied between 260/200 and 160/130 mm. Hg, and the heart was enlarged. The retinae showed bilateral papilloedema, numerous haemorrhages and exudates, with a right macular fan and narrowing of the arteries. There was moderate albuminuria, with occasional hyaline casts. The blood urea was 36 mg. per 100 ml. and the urea clearance 49% of normal. Intravenous pyelography was normal. The cerebrospinal fluid was normal, but the pressure was 250 mm. of water.

Whilst in hospital at that time she had severe headaches, vomited frequently, and had an epileptiform convulsion, but later improved considerably, although on discharge the blood pressure was still 200/150 mm. Hg. In October, 1943, a pregnancy, her first, was terminated on account of her medical condition, but by June, 1945, her headaches had become less frequent and she returned to work. In February, 1946, she had an attack of slurring of speech and drowsiness lasting a week, and was readmitted to Westminster Hospital. With rest and sedatives her blood pressure fell from 210/130 to 160/100 mm. Hg. An electrocardiogram showed left axis deviation with inverted T waves in leads I and CR₄. Papilloedema, exudates, and haemorrhages were no longer present in the retinae, but her physical condition was otherwise the same.

On discharge from hospital she returned to light work, as her headaches had virtually ceased, and thereafter the blood pressure averaged 170/110 mm. Hg. On reassessment in April, 1948, the blood pressure fell to 140/95 mm. Hg with rest in bed, but the heart size was the same as in 1942. There were no exudates or haemorrhages in the fundi, and the cerebrospinal fluid pressure was 120 mm. of water. The blood urea was 39 mg. per 100 ml. and the urea clearance 40% of normal. She is still under observation, and is well.

This patient's condition shows a remarkable spontaneous improvement, over a period of six years, from a severe hypertensive state with encephalopathy to a relatively benign condition. If sympathectomy had been performed in 1942, as had been contemplated, her improvement would no doubt have been attributed to this. Her story indicates the difficulty of assessing such cases with a view to operation.

Another reason for not operating in the early stages is that a high blood pressure is often symptomless, and the patient seeks advice only when the heart or other organs are impaired. The disease may then be well advanced, even beyond the scope of sympathectomy, as in the following case.

Case 10.—A civil servant aged 46 had always been in good health until January, 1948, when he started to have recurrent

sore throats. In 1943 he had been accepted as a first-class life by an insurance company, the blood pressure then being 130/90 mm. Hg. In June, 1948, he was admitted to Westminster Hospital for tonsillectomy, and on pre-operative examination was found to have a blood pressure of 230/150 mm. Hg with pulsus alternans. There was no other cardiovascular abnormality, except that the fundi revealed exudates, haemorrhages, and vascular changes. The blood urea, however, was 120 mg. per 100 ml., and the urea clearance 26% of normal. Whilst in hospital he was free from symptoms and sympathectomy was not performed, on account of his poor renal function. He died from uraemia three months later.

Summary and Conclusions

Twenty-four cases of severe hypertension which have undergone lumbo-dorsal sympathectomy are presented. Their pre-operative state is described, and the results of operation are discussed. The following conclusions are reached: (1) the chances of permanently lowering the blood pressure are slight; (2) retinopathy, when present, may improve considerably; (3) there is not enough evidence to indicate clearly the effect in hypertensive heart disease—some patients may appear to improve temporarily, but this is unlikely with severe disease; (4) operation causes striking symptomatic relief, with notable gain in weight; and (5) in primary malignant hypertension the malignant phase may disappear.

In a properly selected case the relief is greater than that which can be obtained by medical treatment alone. Such cases are not numerous. The operation should be limited to severe and rapidly progressive cases with severe symptoms referable to their hypertensive state which comply with the following conditions: age less than 50 years, the renal function should be good, there should be no evidence of coronary or cerebral artery disease, and there should be no severe heart disease or heart failure.

Operation in early and mild cases is not advisable.

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Dr. F. M. Foote, executive director of the United States Society for the Prevention of Blindness, said in his address to the society's conference in New York: "Among the most serious eye problems that we must tackle is glaucoma. We are all deeply disturbed to know that at least 25,000 Americans are blind from glaucoma and approximately 150,000 more have lost the sight of one eye from this disease. We know that untold numbers of men and women over 35 years of age are working this morning in offices, in industry, in their own homes, unaware that they have early glaucoma—unaware that, unless they are fortunate enough to be among those discovered early, they will lose their eyesight so slowly, so gradually, that a large part of their useful vision will be gone before obvious symptoms bring them to the attention of a competent eye specialist. . . . The best estimates available on eye injuries in industry indicate that each year 100 workers are blinded and an additional 1,000 lose the sight of one eye. It should be possible, 40 years from now, to show that 90% of this unnecessary eye-loss has been prevented. If a man has defective eyesight, as in the case with 40% to 50% of industrial workers, he will find that safety glasses actually help him to do his job better if the hardened lenses are ground to include the correction he needs. Industry is in a position, therefore, not only to prevent accidental loss of sight, but also to help in preventing the loss of a skilled employee because of a visual handicap due to disease."

PAINFUL AMPUTATION STUMPS AND PHANTOM LIMBS*

TREATMENT BY REPEATED PERCUSSION TO THE STUMP NEUROMATA

BY

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Current surgical practice concerned with amputations involves many measures which are designed to protect the stump neuromata from trauma or irritation. At the operation the nerves are often divided as short as possible, while most modern prostheses aim at avoiding pressure on nerves. In spite of these precautions pain in the amputation stump or phantom limb remains common (Sliossberg, 1948), and is often associated with spasmodic twitchings of the stump. The latter may become so violent that the term "epilepsy of the stump" is sometimes used; Weir Mitchell (1872) employed the term "chorea" to describe them.

The medical treatment of these cases has been disappointing, and the difficulties encountered in getting relief by surgical measures is evident from the current neurosurgical practice of treating some of these cases by excising areas of the brain.

The following case records, however, indicate that treatment at the periphery may, after all, prove successful by a very simple procedure. This possibility was considered for three chief reasons. First, in the normal limb nerve endings in the skin are rendered insensitive by occupations which involve repeated minor trauma or prolonged firm pressure on the skin. Secondly, conduction of a mixed nerve is easily interrupted by repeated pressure, without the production of any spontaneous pain. Thirdly, the regenerating nerve fibres in an amputation stump are likely to be no less vulnerable to minor trauma or pressure than are normal nerves and nerve endings. It seemed obvious, therefore, that the effect of maintaining tender neuromata in a chronically concussed state merited investigation.

The first method tried was to deaden the neuromata with procaine and to percuss them for 10 to 15 minutes with a piece of wood.

Case 1

In 1937 a man aged 25 lost portions of four fingers of the left hand in a machine accident. He made a good recovery, and remained fit for work as a carpenter until February, 1942, when the palm of the left hand began to sweat excessively. One year later, while serving in the South African Army, he began to experience sharp stabbing pains in the phantom fingers and dorsum of the hand. On Feb. 28, 1944, the stellate ganglion was excised. The pain was relieved for two weeks, but then returned with great severity.

On examination in Cairo, four weeks after operation, Horner's syndrome was present on the left and the injured hand did not sweat. The ends of the amputation stumps were very tender, especially over some palpable neuromata. There was no sensory loss. On April 2 the digital nerves of the index-finger stump were injected with procaine, and then for about 15 minutes the end of the stump was hammered quite vigorously with a light piece of wood (a wooden test-tube container). This treatment was very successful, and the other tender stumps and scars were similarly treated. Thereafter it was found that if the patient two or three times daily tapped the tips of the amputation stump on a table for several minutes at a time, or if he applied prolonged pressure by handling tools firmly, he could keep all spontaneous pain and stump tenderness in abeyance.

*A preliminary report.

J. C. HARLAND AND F. D'ABREU: LUMBO-DORSAL SYMPATHECTOMY IN SEVERE HYPERTENSION

FIG. 1.—Case 1. Before lumbo-dorsal sympathectomy. Considerable cardiac enlargement and pulmonary engorgement.

FIG. 2.—Case 1. Two months after sympathectomy. Heart size has decreased and there is no pulmonary engorgement.

FIG. 3.—Case 1. Eighteen months after sympathectomy. Heart still smaller than before operation, and still no pulmonary engorgement.

FIG. 4.—Case 5. Malignant hypertension. Left fundus before sympathectomy; showing papilloedema and numerous haemorrhages.

FIG. 5.—Case 5. Left fundus seven months after sympathectomy. Normal appearance.

FIG. 6.—Case 6. Malignant hypertension. Right fundus before sympathectomy; papilloedema, a haemorrhage, numerous exudates, and considerable arterial spasm.

FIG. 7.—Case 6. Right fundus nine months after sympathectomy. Papilloedema has disappeared, and only a few small old exudates remain. Some areas of retinal degeneration and some branches of retinal artery in spasm.

T. PARKINSON: EOSINOPHILIC XANTHOMATOUS GRANULOMA WITH HONEYCOMB LUNGS

FIG. 1.—Cystic rarefaction in right femur below old fracture.

FIG. 2.—Generalized reticulation in both lungs.