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INDICATIONS FOR SYMPATHECTOMY
IN ESSENTIAL HYPERTENSION

Senior Thesis

by

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Introduction

Essential hypertension is a disease characterized by a persistent, progressive elevation of blood pressure due to constriction, at first functional, then organic, of arterioles widely distributed in the body. (1) Boyd states that it is due to spasm of arterioles which leads to hypertrophy of arteriolar muscle, then degeneration of muscles from exhaustion with fibrous replacement. (3) This condition may last for many years, but the patient usually dies of a cerebral accident or of cardiac failure. Eventually signs of renal failure will be evident, particularly decreased concentrating power. When the latter develops early, malignant hypertension is said to be present. (3)

The etiology is unknown. Goldblatt (2) stated that it was due to an ischemic kidney, but many kidneys of an essential hypertensive show nothing. This was well demonstrated by Castleman and Smithwick (4) who performed 100 kidney biopsies on patients undergoing sympathectomies. Fifty per cent had no significant arteriosclerosis. Venous stasis about the renal area will cause an increase in blood pressure. When the stasis is relieved, the pressure is lowered. (7) Deficient oxygenation of accumulated metabolites may be the answer. An hereditary factor can not be denied (12),

as well as a constitutional abnormality. (1) The latter may be demonstrated by the so-called "cold pressor" test of Hines and Brown. (11) It is believed that this hyperactive, sympathetic, vasomotor mechanism may be acquired or influenced by environment.

Surgical therapy for relief of symptoms in patients suffering from primary or essential hypertension has become an accepted procedure. The surgical approach to the treatment of this disease is physiologic in nature. It is not the removal of pathological tissue that accomplishes the desired result, but the physiological response to removal of sympathetic ganglia and rami.

The development of sympathectomy for the relief of essential hypertension began in 1925 when Adson (21) did a bilateral rhizotomy of the sixth thoracic to the second lumbar roots, inclusive. Later he employed lumbar sympathectomy and celiac ganglionectomy with partial resection of both adrenal glands. Smithwick, in 1939, developed the procedure now in use in most clinics: bilateral dorsolumbar sympathectomy and ganglionectomy, removal of the sympathetic chains from below T-8 to below L-2, the splanchnic nerves, and the removal of all or part of the celiac plexes.

The operation is performed in two stages. (6) Popen (20) has gone farther than Smithwick to include ganglionectomy from D-4 through L-2. It appears that the more extensive the procedure the more favorable the result.

Since this type of treatment for essential hypertension is comparatively new, there remain many unsolved problems. The most important of these is that of selecting patients for the procedure and deciding which should be treated medically. For this reason, the indications for sympathectomy form the basis of this thesis.

Indications for Sympathectomy

Although this procedure may be effective in cases of hypertension from other causes, e.g. pyelonephritis (24) it is used primarily for essential hypertension. This disease may be divided into four groups clinically. (8, 13, 15) Group I consists of cases in which there is constriction of retinal arteries, a slight increase in blood pressure which ordinarily becomes normal as a result of rest, and normal renal function. In Group II have been placed cases with moderate sclerosis of retinal arteries with some nicking and tortuosity, moderate to severe hypertension, and normal renal function. Group III includes patients with marked arteriolar changes associated with retinitis, hemorrhages or exudates, moderate to severe hypertension, and some impaired renal function. Group IV consists of cases of malignant hypertension, the retina showing papilledema, hemorrhages and exudates, a severe, stable hypertension, and impaired renal function. Few patients can definitely be classified into any one of these groups, however they are used extensively in the literature and serve the purpose of selecting patients for this operation. Some authors (1,8,14) expressed the opinion that sympathectomy

was to be reserved for patients in groups II and III. Recently this viewpoint has changed somewhat. Peet and Isberg (19) made a study of 13 cases of malignant hypertension. Their results showed that this diagnosis is a definite indication for splanchnic resection and should be done as soon after the diagnosis is established as possible, "provided deterioration has not yet advanced to the constitutional extent where surgical treatment has been found to be unavailing".

Persistent and progressive high diastolic blood pressure above 100 Hg. which does not respond to medical management is the most important sign to indicate sympathectomy. (1,8,13) Increased systolic pressure is not an important factor, since the diastolic pressure indicates the state of arteriolar constriction. Smithwick (25) has found pulse pressure to be a valuable guide in the selection of patients. He found that in 215 cases who have been followed from one to five years, the higher the pulse pressure, the poorer the results.

The best results have been reported from patients who were intermittent hypertensives and even showed normal blood pressures at times. Most of them were demonstrated to be hyperreactors. Therefore, it has

been concluded that group I and group II may be the ideal groups for which this treatment is indicated. (9,10,13,25)

Fisberg (10) reported on 119 patients and from this survey showed that certain selected persons with signs of retinal lesions, congestive heart failure, cerebral hemorrhage (20), convulsions due to hypertensive encephalopathy and symptoms of Raynaud's disease responded well after sympathetic resection. Although some of these cases died within a relatively short time most of their clinical signs were improved. The congestive heart failure responded so well that the circulation time and venous pressure became normal. Voris and others (26,28) state, however, that cerebral accidents and heart failure are definite contraindications for sympathectomies.

Most authors agree that the best results are obtained from patients under 50 years of age without marked renal and cardiac damage and in the early stages of the disease. (5,10,25,28) Females appear to respond more readily than males. (25)

If the symptoms of essential hypertension have progressed to the point where the individual's life is unbearable or where he is of little value to himself or others, surgical treatment should be

instituted. (6,10) Some of the symptoms which may be responsible are severe headache which will not respond to medical management, restlessness and fatigue which incapacitates the patient, dizziness, dyspnea, and cerebral symptoms. Even though the life expectancy may not be increased there is evidence to show that their remaining time is made more tolerable.

There have been many tests and procedures advocated to indicate which patient will respond to sympathectomy. Some have proven of value, but it is the general opinion that none of them are entirely reliable. Birchall (2) has shown that the use of tetraethyl ammonium chloride is of no value because it acts so diffusely in the body that its effect upon the blood pressure may be brought about by its action on more than the sympathetic nervous system. On the other hand, two articles by Russek and his co-workers (22,23) conclude that the finest procedure available is that of continuous caudal anesthesia. They point out the advantage of safety and the fact that this type of anesthesia blocks the sympathetics in the area which will be involved by surgery. Going farther, they state that it is possible to tell how extensive the resection will have to be in order to

get the desired results for each patient.

One of the older and still more widely used tests is that of Hines and Brown, the "cold pressor test". (11) Certain modifications have been made in this test by Smithwick and others (26,27) but it remains essentially the same. It is of great value in determining which patient in an early stage is a hyperreactor and may go on to advanced stages of the disease. It was previously stated that the earlier surgical treatment is instituted the better the results will be. Here lies the importance of this test. Sedation is another widely used procedure. Usually sodium amytal is given to the patient until no further drop in blood pressure is noted. If a significant fall can be procured, then it is assumed that the arteriolar constriction is not irreversible, and that these vessels will respond to the interruption of their nervous control. Bed rest alone may be enough to show the reversibility or irreversibility of an hypertensive state. If the blood pressure drops, surgery may be indicated. Results from these tests are summarized by Voris.(28) He states that with rest the blood pressure should fall to 140 mm Hg. systolic and to 100 mm Hg. diastolic. If it does not go below 160/100, results

from surgery will be poor. Twelve grains of sodium amytal given orally in two doses two hours apart should decrease the diastolic pressure below 100 mm Hg. He does not advise the use of sodium pentothal.

Other laboratory procedures should include kidney function tests, e.g. phenolsulfonphthalein, concentration, and urea clearance, electrocardiographs, the six foot heart x-ray, blood chemistry including non-protein nitrogen, urea nitrogen, and creatinine, intravenous urography, routine blood and urine examination, and basal metabolism. (14) When all these tests are evaluated it can be determined whether or not a patient is a safe surgical risk. These tests are invaluable in selecting patients for surgical treatment. An excellent "three day work-up" is to be found in DeTakats' paper, "Surgical Treatment of Hypertension" and Coleman's article on selection of patients for sympathectomies. (6)

Before concluding this section on indications an excellent paragraph from a publication by David Ayman (1) should be quoted. Summarizing, he states, "It must be emphasized that brief preoperative hospital observation as practiced throughout the country is not an adequate basis for determining the

advisability of an operation and certainly not for evaluating drops in blood pressure short of normal levels....The physician who sees his patient month in and month out for several years, who carries out proper studies of heart, kidneys, and fundi from time to time, and who makes careful records of blood pressure levels at all visits is best qualified to determine whether the patient's condition is stationary, slowly progressive, or rapidly progressive. The findings of a stationary state without demonstrable damage of the heart, brain, or kidneys is a reason for maintaining the status quo. If, however, it was noted in 1943 for example that the heart and electrocardiogram were normal, but in 1944 the heart had increased in size on a seven foot X-ray film, or the electrocardiogram shows left ventricular strain, then an indication for operation seems established. The development of inconstant or constant albuminuria or decrease in the concentrating ability of the kidneys, and the finding of constricted vessels or hemorrhages in a previously normal ocular fundus are reasons for advising operation. Finally, a persistently rising blood pressure level in a patient observed over an adequate period -- months to several years -- is another indication for recommending operation.

Contraindications for Sympathectomies

A patient who has essential hypertension that has progressed to the point of extensive renal or cardiac damage should not be operated. Signs and symptoms of these conditions must be thoroughly investigated along with laboratory studies, and an evaluation of each patient made. There is little need to impose as extensive a procedure as sympathectomy when the outcome is hopeless. Cardiac or renal failure are contraindications enough for any type of surgery. Most contributors to the literature state that patients falling into group III and IV are not suitable for this procedure. DeTakats reports that in their large series no change in the course of the disease was accomplished on groups III and IV. This appears to be the general outlook, although some (13,14) are firm in their belief that these patients should have whatever benefits surgery can give them. Malignant hypertension was at one time a definite contraindication to sympathetic resection, however, more and more of these cases are being operated. One reason for this is the view that since the case is hopeless and will terminate soon, any chance to help should be taken. Reports have been fairly encouraging, and malignant hypertension is classed along with the

early hypertensives now as a possible indication.

(13,19,20) Final conclusions will have to be made in the future, since the entire subject is in a state of flux.

Cerebral accidents on the whole are not considered as contraindications. (6,8,20) Arteriosclerosis on the other hand is a definite one, since arterioles with small permanent lumina cannot be made to dilate. This appears to be the primary reason for not selecting individuals over 50 or 55 years of age for operation.

Recurrent precordial pain relieved by nitrites, fixed severe hypertension, and patients with no symptoms or signs of progressing essential hypertension are further contraindications. (8,10,28)

If a person is responding well to adequate medical management and shows no evidence of constitutional deterioration, no surgery should be suggested. Reasons for this are twofold: First, patients may live for years with a definite hypertension without manifesting any symptoms. Second, regeneration of the sympathetic system is a reality. (14) Because the results of this procedure are so variable and unpredictable, no patient should undergo resection unless he is absolutely sure it is his desire and not his

physician's. This is a real contraindication. The facts should be presented honestly, allowing the patient to make his own decision.

Chronic pyelonephritis and hypertension acquired during pregnancy are not contraindications for sympathectomy,(6,9) but hypertensive states secondary to some other underlying pathology are. These conditions should be diagnosed and treated specifically and not as essential hypertension, since the rise in blood pressure is a symptom of the existing disease. The following are conditions where this surgical procedure should not be used: polycystic kidney, coarctation of the aorta, pheochromocytoma, arteriosclerosis, glomerulonephritis, hyperthyroidism, and other endocrin dysfunctions, increased intercranial pressure, and heart lesions.

Conclusion

Sympathectomies as treatment for essential hypertension is becoming more popular as this possibility is being explored. The results have been gratifying in most instances where careful selection of patients has been made. At the present time indications for this type of surgery appear to be the most important problem to solve to obtain satisfying results. There is some disagreement in the literature on which type of patient is suitable for this procedure but for the most part a case of early essential hypertension is the one of choice. Here vasospasm and not arteriosclerosis is the underlying pathology which will respond to sympathetic resection. Patients should be studied carefully over a long period of time. If they do not respond to medical management, or if this condition shows signs of progression, then surgery is indicated.

A careful evaluation of the cardiovascular and renal systems must be made. Damage to these organs is a contraindication. Nor should sympathetic resection be done in diseases where high blood pressure is merely a manifestation of some other organic pathology.

This subject is a comparatively new one. Opinions have changes in the past and will do so in the future. it is imperitive that every physician interested in this disease study and evaluate for himself the literature as it appears.

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