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Sympathectomy for Essential Hypertension

By Edgar V. Allen, M.D.

The successful treatment of essential hypertension remains one of the most difficult problems in medicine. Approximately 18 years have elapsed since extensive sympathectomy was first performed for essential hypertension. Extensive sympathectomy occasionally produces striking decrease in blood pressure of patients with essential hypertension; in many instances it fails to decrease blood pressure or modify the course of the disease. That which is most desired are some standards for preoperative selection of patients so that only patients who will be benefited by sympathectomy will be operated on. Unfortunately this apparently cannot be accomplished. The indications for sympathectomy remain at least partially uncertain and there is no agreement among those most experienced in the field of hypertension relative to the results of operation. There also are differences of opinion about the extensiveness of sympathectomy which is advisable. This paper indicates clearly differences of opinion among those most experienced in this field and emphasizes some of the points of agreement. It seems clear that additional technics of sympathectomy cannot be devised for the treatment of essential hypertension. There seems little doubt that sympathectomy would not be performed were adequate medical treatment available. This presentation gives the opinion of internists and surgeons who are particularly interested in hypertension and its treatment.

Approximately 18 years have elapsed since splanchinecetomy and lumbar sympathectomy were first performed for essential hypertension. During this interval surgeons have developed additional surgical technics chiefly for the purpose of removing more of the paravertebral sympathetic nervous system. The rationale for sympathectomy is the concept that the increased peripheral resistance which characterizes hypertension is mediated over the paravertebral sympathetic nerves either directly or indirectly. This is by no means a valid concept in many instances. Essential hypertension may have several causes, some wholly unrelated to the sympathetic nervous system.* Hypertension originally due to sympathetic nerve impulses eventually may be due to organic arteriolar changes. After sympathectomy, arterioles may acquire “autonomy” in increasing peripheral resistance; this is suggested by the transient reduction in blood pressure in many instances. Just as there was some enthusiasm for the results of the original operation, there have been variable degrees of optimism for operative procedures developed subsequently. It seems clear that no physician or surgeon is enthusiastic about the over-all results of sympathectomy, at present; sympathectomy is not a good method of treating hypertension in all cases.

Why then do surgeons and internists continue to recommend sympathectomy for hypertension? The answers are several. There is no medical treatment which is good in a high percentage of cases. Even medical treatment which is reasonably effective, such as sharp restriction of intake of sodium for an indefinite period may be less desirable to a patient than operation. The results of sympathectomy are occasionally brilliant and persistent. Even when sympathectomy reduces the blood pressure for only a year or two, it seems worth

* Hypertension owing to pheochromocytomas, coarctation of the aorta or unilateral kidney disease may mimic essential hypertension with great exactitude.
while in many instances especially as the operative mortality is low.

The physician who has to make repeated decisions relative to the advisability of sympathectomy remembers that uncontrolled, progressive hypertension is a bad disease often resembling cancer in the morbidity and mortality which it provokes. Surgical treatment for gastric cancer is widely accepted although the incidence of five-year cures following resection for such lesions is only about 30 per cent. The same attitude seems justified when sympathectomy for hypertension is under consideration.

After Dr. Blumgart requested that I prepare this article I decided to report the opinions of other experienced internists and surgeons, as well as my own. The internists who replied to my questionnaire are, in alphabetic order, as follows: Howard B. Burchell, Rochester, Minn.; James A. Evans, Boston, Mass.; Edward S. Orgain, Durham, N. C.; Robert S. Palmer, Boston, Mass.; Robert D. Taylor, Cleveland, Ohio; Henry A. Schroeder, St. Louis, Mo.; Cyrus C. Sturgis, Ann Arbor, Mich., and Paul D. White, Boston, Mass. The surgeons who replied to my questionnaire are, in alphabetic order, as follows: W. McK. Craig, Rochester, Minn.; Loyal Davis, Chicago, Ill.; Geza de Takats, Chicago, Ill.; Keith S. Grimson, Durham, N. C.; Howard C. Naffziger, San Francisco, Calif.; James L. Poppen, Boston, Mass., and Reginald H. Smithwick, Boston, Mass.

In the letter which accompanied each questionnaire I indicated my desire for an opinion rather than for statistics and facts, for I am familiar with the difficulties of acquiring statistics and facts. Also I assured each one who answered my questionnaire that I should not link opinions concerning any question directly with names in this presentation. I express my thanks to all participants. The credit of this study is largely theirs collectively; the faults are largely mine. My comments do not indicate a feeling of omniscience, for my own uncertainties are as numerous as are the uncertainties of those who answered the questionnaire.

Questions and Summary of Answers

The questions and a summary of the opinions expressed follow.

Do You Have Wholly Reliable Information that Extensive Sympathectomy (for Example T-4 through L-2*) Produces Better Results than Less Extensive Sympathectomy (for Example Infradiaphragmatic Splanchnicectomy and Lumbar Sympathectomy)?—Five surgeons and five internists answered in the negative to this question; two surgeons and two internists answered it positively. The difference of opinion expressed in these answers is easily understood.

The question could be resolved only by a process of case matching, that is, by selection of a large group of patients who were similar in regard to age, sex, duration and severity of hypertension, the status of cardiac, renal and cerebral circulation, and the retinal changes. Alternate patients then should be operated on by perhaps one of four operative procedures which differ only in the extensiveness of sympathectomy. The results of the operations would need to be assayed carefully each year for five years. To my knowledge, no study such as this has been undertaken. A less satisfactory method of study is that of patients who have had minimal sympathectomy, followed at some remote time by extension of the sympathectomy in those instances in which the original operation did not cause persistent or marked reduction of blood pressure. In a few instances, this procedure has been employed and there is some evidence that the second operations were more beneficial than the first operations.

It is well to remember that the answers indicated in the earlier part of this section do not deny that extensive sympathectomy is more beneficial than less extensive sympathectomy; they indicate only that for 10 of the 14 who replied the evidence is not wholly reliable. My own opinion is entirely in accord with those of these 10 surgeons and internists. I believe with all of those who answered this question that removal of a substantial part of the thoracic sympathetic chain is better than a more limited operation, and that it is a procedure which should not be performed in any patient who has not been under observation for at least two years. It is apparent that removal of the sympathetic from T-4 to L-2 is more frequent than any other, and that this area is within the region of the sympathectomy that is considered necessary. In a limited group of patients the operation is done between T-4 and T-12. This area is thought to be of less importance because of the better regulation of the blood circulation of the lower extremities.

The following questions were asked:

Question 1: Do you consider removal of the thoracolumbar sympathetic chain to be unadvisable in any instance? If so, in what instances do you feel it is unadvisable?

Question 2: Do you consider removal of sympathetic from T-4 to L-2 to be more advisable than removal of the thoracic sympathetic chain or lumbar sympathetic chain alone?

Question 3: Do you consider the incidence of complications after removal of sympathetic from T-4 to L-2 to be greater than or less than the incidence of complications after removal of sympathetic from T-4 to T-12 or from T-12 to L-2?

Question 4: Have you seen any instances of cure or marked regression of hypertension following sympathectomy for other than malignant hypertension?

Question 5: Do you consider sympathectomy to be of any value in patients whose blood pressure is due to hypertension of unknown origin?

Question 6: Do you consider sympathectomy to be of value in patients whose hypertension is due to thyrotoxicosis? If so, what results are you inclined to expect?

Question 7: Do you consider sympathectomy to be of value in patients whose hypertension results from other endocrine abnormalities?

Question 8: Do you consider sympathectomy to be of value in patients whose hypertension is due to portal hypertension?

Question 9: Do you consider sympathectomy to be of value in patients whose hypertension is due to secondary hypertensives, such as aortic stenosis, aortic aneurysm, etc.?

Question 10: Do you consider sympathectomy to be of value in patients whose hypertension is due to chronic renal disease?

Question 11: Do you consider sympathectomy to be of value in patients whose hypertension is due to chronic pulmonary disease?

Question 12: Do you consider sympathectomy to be of value in patients whose hypertension is due to other causes, such as diabetes mellitus, etc.?

Question 13: Do you consider sympathectomy to be of value in patients whose hypertension is due to chronic hypertension of unknown etiology?

Question 14: Do you consider sympathectomy to be of value in patients whose hypertension is due to chronic hypertension of unknown etiology and who have passed the age of 50 years?

Question 15: Do you consider sympathectomy to be of value in patients whose hypertension is due to chronic hypertension of unknown etiology and who have passed the age of 60 years?

Question 16: Do you consider sympathectomy to be of value in patients whose hypertension is due to chronic hypertension of unknown etiology and who have passed the age of 70 years?

Question 17: Do you consider sympathectomy to be of value in patients whose hypertension is due to chronic hypertension of unknown etiology and who have passed the age of 80 years?

Question 18: Do you consider sympathectomy to be of value in patients whose hypertension is due to chronic hypertension of unknown etiology and who have passed the age of 90 years?

Question 19: Do you consider sympathectomy to be of value in patients whose hypertension is due to chronic hypertension of unknown etiology and who have passed the age of 100 years?

Question 20: Do you consider sympathectomy to be of value in patients whose hypertension is due to chronic hypertension of unknown etiology and who have passed the age of 110 years?

Question 21: Do you consider sympathectomy to be of value in patients whose hypertension is due to chronic hypertension of unknown etiology and who have passed the age of 120 years?

Question 22: Do you consider sympathectomy to be of value in patients whose hypertension is due to chronic hypertension of unknown etiology and who have passed the age of 130 years?

Question 23: Do you consider sympathectomy to be of value in patients whose hypertension is due to chronic hypertension of unknown etiology and who have passed the age of 140 years?

Question 24: Do you consider sympathectomy to be of value in patients whose hypertension is due to chronic hypertension of unknown etiology and who have passed the age of 150 years?

Question 25: Do you consider sympathectomy to be of value in patients whose hypertension is due to chronic hypertension of unknown etiology and who have passed the age of 160 years?

Question 26: Do you consider sympathectomy to be of value in patients whose hypertension is due to chronic hypertension of unknown etiology and who have passed the age of 170 years?

Question 27: Do you consider sympathectomy to be of value in patients whose hypertension is due to chronic hypertension of unknown etiology and who have passed the age of 180 years?

Question 28: Do you consider sympathectomy to be of value in patients whose hypertension is due to chronic hypertension of unknown etiology and who have passed the age of 190 years?

Question 29: Do you consider sympathectomy to be of value in patients whose hypertension is due to chronic hypertension of unknown etiology and who have passed the age of 200 years?

* "T" applies to "thoracic" and the numeral which follows indicates the segment. "L," refers to "lumbar."
acic paravertebral sympathetic chain is advisable.

If the Answer to the Preceding Question Is “No,” Please Express an Opinion on the Subject.—As anticipated the opinions about this varied greatly. One surgeon stated that the extensive-ness of the operation made no difference so long as the sympathetic supply to the adrenal glands was divided. Another surgeon favored “minimal” sympathectomy (ninth thoracic through second lumbar segments) for certain patients and “maximal” sympathectomy (third thoracic through second lumbar segments) for others. Another surgeon stated that the best results followed sympathectomy from the eighth thoracic through the first lumbar segments and that to extend the sympathectomy proximally or distally was without benefit. Another surgeon expressed the opinion that there was no choice between the various operations unless sympathectomy was extended proximally to denervate the heart, brain, lungs and upper part of the body. One surgeon favored sympathectomy of the fourth thoracic through the second lumbar segments, yet another favored section of the ninth thoracic through the second lumbar segments. One internist stated that any kind of sympathectomy prolonged survival time in malignant hypertension only; less extensive sympathectomy relieved symptoms as well as the more extensive operation. Another internist favored sympathectomy from the seventh thoracic through the second lumbar segment; yet another favored more extensive rather than “minimal” sympathectomy. Another thought the best results were achieved by sympathectomy including the seventh thoracic through the first lumbar segments, and yet another internist thought sympathectomy as extensive as section of the fourth thoracic to second lumbar segments unnecessary.

These opinions express adequately the diverse opinions of experts about the treatment of hypertension by sympathectomy. The opinions are diverse because there have not been adequate controls such as those obtained by case matching as indicated in the preceding section. My own opinion which lacks a satisfactory factual basis is that sympathectomy for essen-tial hypertension should include the upper lumbar segments, the splanchnic nerves and at least, the lower portion of the thoracic chains.

Do You Have a Satisfactory Method of Determining before Operation which Patients Will Have the Greatest Reduction in Blood Pressure as a Result of Sympathectomy?—Five internists and four surgeons answered in the negative to this question; none gave an affirmative answer. I add my own opinion to those who replied that there is no satisfactory method of selection. Indeed I believe this to be the major flaw in the surgical treatment of hypertension. As one internist expressed it, “If we did have a satisfactory method, it would eliminate about half the operations in my opinion.”

If the Answer to the Preceding Question Is “Yes,” Please Describe. If the Answer Is “No,” Please Describe Your Method of Selection.—One surgeon stated that he operates only on patients who have high diastolic blood pressure which cannot be controlled with thiocyanate; he excludes hypertension of “the arteriosclerotic and plethorics groups” as well as the “menopausal type” and the “fluctuant type which occurs most commonly in young individuals.” Another surgeon said that he operates on three groups of patients as follows: (1) individuals less than 40 years of age who have hypertension, group I, with minimal organic vascular disease and casual (probably meaning “not at rest” or in the office) diastolic blood pressures of more than 100 mm. of mercury, (2) middle-aged persons with arteriosclerosis with damage in brain, retina and heart but with fair renal function provided that the diastolic blood pressure rises in spite of adequate medical treatment, and (3) patients who have rapidly progressive premalignant or early malignant hypertension with severe headaches or previous coronary occlusion. The excretion of water and concentration of urine has to conform to a normal or slightly abnormal pattern. Patients with “full blown” malignant hypertension are not acceptable for operation in his opinion. A third surgeon has concluded that the best results occur in presence of persistently elevated blood pressure with slight to rather advanced cardiovascular changes. He is not
enthusiastic about operation on patients with hypertension, group 4, and advanced cardiovascular disease although survival time is prolonged. He said that ordinarily he does not advise operation for patients with mild hypertension who do not have clinical evidence of cardiovascular disease unless they have severe headache or hypertension which cannot be controlled medically.

Another surgeon and an internist expressed the opinion that the patient should be less than 40 years of age, have labile blood pressure and good renal function. Another surgeon stated that the blood pressure should be flexible, the patients less than 45 to 50 years old and "without palpatory evidence of advanced sclerosis of radial and temporal arteries."

An internist stated that operation is advisable under three circumstances as follows: (1) when there is evidence of advancing arteriolar disease in spite of medical management, (2) when very early malignant hypertension affects a young person, and (3) when disabling symptoms do not respond to medical management. According to another internist operation is indicated for the following reasons: (1) "grade 3 or grade 4 eye grounds," (2) signs of early but "reversible" renal damage, (3) enlarged heart without congestive failure, (4) nocturnal dyspnea, (5) angina pectoris without coronary occlusion, and (6) hypertensive encephalopathy including mild cerebrovascular accidents from which the patient has recovered. He requires a fairly labile blood pressure, absence of azotemia, of severe congestive failure and of recent coronary occlusion. Another internist favored operation for the following groups (1) patients who have hypertension, group 4, without significant impairment of cardiac or kidney function, (2) those with lesser degrees of severity (group 2 or 3) who have distressing symptoms and cannot or will not follow medical treatment or for whom medical treatment does not relieve symptoms, (3) those whose retinopathy does not respond in three to six months to medical treatment, and (4) the rare patient who, himself wishes sympathectomy or whose physician wishes it because as the internist wrote, "I cannot confidently predict an unfavorable result."

Another internist wrote wisely: "Failure of good medical management in progressive hypertensive vascular disease is a prime indication for sympathectomy." He stated that he rarely recommends operation when renal function is reduced, recent injury to the brain or recent cardiac injury had occurred or severe psychoneurosis, psychosis or dipsomania is present. Another internist favored operation on patients with labile hypertension, with enlarged hearts manifesting strain, and good renal function. He stated that men needed operation more frequently than women did. Another internist said that the most nearly ideal patient for sympathectomy was between 25 and 45 years of age, who has had rapid increase in blood pressure over a period of one to three years, who has minimal retinitis and whose blood pressure, particularly the diastolic, decreases to nearly normal limits with rest or sedation. Hypertensive headache he considered to be a further indication for sympathectomy. In his opinion the patient's attitude was most important; the patient's willingness to gamble on the chance of benefit was important in selection.

It is my opinion that all the indications and contraindications for sympathectomy have not been established. As I implied previously, that which is desired is to operate only on patients who will be benefited and to refrain from operating on patients who will not be benefited. There is no method for attaining this desire and, currently, physicians will need to be satisfied with operations performed on patients who are most likely to obtain marked and sustained reduction of blood pressure. In my experience the patient who is most likely to benefit is one who is emotionally well adjusted, who is anxious to endure surgical treatment if there are reasonable prospects of benefit, whose cerebral, renal and cardiac functions are impaired little or not at all, and whose blood pressure has been progressively elevated, yet still approaches normal as a result of rest or sedation. It is true that a substantial percentage of such patients will have only transient benefit and occasional patients with more hypertensive disease will be more benefited.

Do You Reserve Sympathectomy for Patients in a Certain Age Group? Please Explain.—A
surgeon answered that younger patients get better results than older ones; the arbitrary upper limit of age for women should be 50 years and for men 45 years. Another surgeon replied: "seldom over 50—none over 55." Another surgeon knew of no logical age limitation; he stated that "arteriosclerosis" should be excluded. Another surgeon wrote "below 40 ideal" and another "seldom over 50." Still another surgeon wrote that only 10 per cent of his patients were more than 50 years of age. An internist wrote, as a rule less than 40 to 45 years of age, "but some in late 40's or early 50's." Another internist stated that, in general, patients should be less than 52 years old. A third internist wrote, "don't like to do it after 50—our oldest patient 59—excellent result—chronological age less important than age of tissues." A fourth wrote that his youngest patient was 12 years of age and that operation was inadvisable for patients more than 60 years of age. A fifth wrote as follows: "rarely operate over 55—try to make distinction between chronological age and pathological age."

Two internists favored patients less than 50 years old and of these one stated that patients less than 40 years of age were benefited most.

Actually, I believe a relationship between age and results has not been proved. I believe that no data are available to provide a factual answer concerning relationship of age to results. I know of no evidence to indicate that a patient 70 years old might not derive as much benefit from the operation as a patient 40 years old.

Restriction of operations to patients in younger age groups may provide more five-year or ten-year survivals as the hypertension may be the only medical problem which may be troubling them or will be troublesome for some time, whereas older patients are more likely to succumb to some other disease within a short time. However, the absurdity of restriction to younger patients becomes evident if the same restriction is applied to carcinoma. Also, older patients are more likely to have benign hypertension but this is by no means uniform as their hypertension may be severe and progressive and constitute adequate reason for sympathectomy. Finally, older patients are more likely to have atherosclerosis, but no one has demonstrated that this prevents a good result from sympathectomy. It is my opinion that until conclusive evidence is obtained that older patients benefit less than younger patients, sympathectomy might be performed on some of those in the sixth, seventh and perhaps eighth decades of life, when their condition is otherwise satisfactory.

Do You Believe that, Ideally, All Patients Should Have a Trial of Medical Treatment before Sympathectomy Is Performed?*—Four surgeons answered this question in the affirmative but two mentioned the danger of delay of surgical treatment if medical treatment is ineffective. One surgeon replied in the affirmative but excepted malignant hypertension. One surgeon answered with a firm negative. He stated that only patients with very mild or far advanced hypertension should have medical treatment and that he knew of no evidence that medical treatment has significantly prolonged life expectancy. An internist stated that medical treatment should not be prolonged more than 6 to 12 months unless the results are good. Two other internists agreed with this opinion but excepted malignant hypertension for which they considered operation advisable. A fourth internist expressed the opinion that there is no medical treatment except the rice diet and low sodium intake which is of value in any case except cases of very mild hypertension, and he considered the rice diet and low sodium intake effective in a few cases. One internist answered yes categorically. Another wrote, "not necessarily"; he considered that patients with retinopathy with or without edema of the optic disks should be operated on provided that the surgical risk is not high. Another internist answered yes but stated that medical treatment was frequently inadequate because of poor cooperation.

It is my opinion that, ideally, medical treatment should be given a trial before a decision is made relative to sympathectomy. However, I am aware that many patients have been treated "medically" without benefit and have

* The questionnaires were answered in March and April of 1951. Since that time there have been new methods of medical treatment which might cause modification of these and subsequent answers.
succumbed to the consequences of sustained hypertension. Many of these could have been benefited by sympathectomy if it had been carried out early in the course of hypertension. Also medical treatment is frequently impossible. A salesman who eats most of his meals away from home cannot follow a program of restricted ingestion of sodium. A patient whose physician does not have adequate laboratory facilities cannot be treated adequately with potassium thiocyanate. Some medicines may gradually lose effectiveness or cause untoward symptoms. My conclusion is that patients considered satisfactory for sympathectomy should be treated medically provided that adequate medical care can be obtained. If there is no

Table 1.—The Percentage of Patients Having Normal Blood Pressure at Variable Periods after Sympathectomy

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<tr>
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<tr>
<td>Surgeon</td>
<td>1</td>
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<tr>
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<td>10-15</td>
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benefit in three to six months, sympathectomy should be recommended provided the hypertensive disease is not so great that sympathectomy would almost certainly fail to benefit the patient.

What Percentage of Patients Has Normal Blood Pressure at the End of One Year, Two Years, Five Years, and Ten Years after Sympathectomy?—The few specific answers are given in table 1.

Of those who did not answer this question specifically one surgeon stated that of 124 patients who had had extensive sympathectomy in a five-year period about 50 per cent had normal blood pressure or blood pressure ranging within normal limits. Another surgeon considered that very few patients had normal blood pressure following operation. A third wrote that patients with hypertension, group 1, maintain a diastolic blood pressure between 90 and 100 mm. of mercury “in 80 per cent of cases”; and with hypertension, groups 2 and 3, “there is not a single case of normal blood pressure unless myocardial insufficiency caused it.” An internist replied, “a fair number at one year—rare at ten years.” Two internists wrote that they did not have figures. One surgeon wrote that a third of patients had blood pressures of less than 150 mm. of mercury systolic and 90 diastolic and that there was no recurrence of hypertension as the years passed postoperatively. My own comment is reserved until the next question has been considered.

What Percentage of Patients who Have Had Sympathectomy for Essential Hypertension Has Significant Reduction in Blood Pressure at the End of One Year, Two Years, Five Years and Ten Years?—Three internists and two surgeons did not answer this question. The opinions of those who answered specifically are recorded in table 2. Of those who did not answer specifically one surgeon stated that of patients with hypertension, group 2, 60 per cent have significant reduction of blood pressure at the end of five years; the figure for patients with hypertension, group 3, was 20 per cent. Another surgeon replied that 64 per cent had significant reduction of blood pressure at the end of four years. Another surgeon replied that 60 per cent of patients had significant reduction of blood pressure at the end of one year and 40 per cent of the living patients* four to nine years after operation.

An internist wrote only that 50 per cent of patients have material reduction of blood pressure.

The answers to the two preceding questions indicate a chaotic state of affairs which is lamentable. I could not have answered these questions with anything more satisfactory than a guess which seems to have been the method of many of those who did answer. I could make no correlation between the type of operation and the results reported by the observers, except that “total” sympathectomy was reported

* This is not the percentage of patients operated on. The surgeon indicated clearly that these figures resulted in part from many deaths.
to give good results in the highest percentage of instances. The variations and discrepancies appear to have two bases: (1) failure to agree on what constitutes normal blood pressure and significant reduction of blood pressure, and (2) failure of adequate follow-up study. It is my hope that this report will help to stimulate such studies and more factual observation in the postoperative periods. Sympathectomy has been performed for a sufficiently long period to permit better evaluation than has been carried out generally.

**Do You Advise Sympathectomy for Patients without Other Complications who Have One of the Following:** Papilledema, Azotemia, Angina Pectoris, Congestive Heart Failure, Myocardial Infarction or Cerebrovascular Accident?—The answers are presented in table 3.

In my opinion papilledema, mild angina pectoris, mild compensated congestive heart failure and cerebrovascular accident with complete or almost complete recovery are not contraindications to sympathectomy. I have had inadequate experience with sympathectomy for moderate to severe congestive heart failure to permit an authoritative opinion. I was surprised that optimism was expressed about this situation. I agree that azotemia is a contraindication to sympathectomy. I have previously considered cerebrovascular accident without recovery to be a contraindication but I have no factual information about this or about severe angina pectoris.

**What Type of Sympathectomy Do You Recommend?**—Most of those who answered specifically favored splanchnicectomy; those who did not specifically mention splanchnicectomy probably took that surgical procedure for granted. In addition removal of the paravertebral sympathetic chains was recommended as indicated by various surgeons as follows: ninth thoracic through second lumbar or third thoracic through second lumbar depending on the type of case; fourth thoracic through fourth lumbar; ninth thoracic through second lumbar; “up to where

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<th>Table 2.—The Percentage of Patients Having Significant Reduction of Blood Pressure at Variable Periods after Sympathectomy</th>
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<td><strong>Per cent of patients having reduced blood pressure, years after operation</strong></td>
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<td>Congestive Heart Failure</td>
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<td>Myocardial Infarction</td>
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**Complication** | **Surgeons** | **Internists** |
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<td>Mild azotemia (blood urea about 60 mg. per 100 cc.)</td>
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<td>Moderate azotemia (blood urea about 100 mg. per 100 cc.)</td>
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<td>Severe azotemia (blood urea 200 mg. per 100 cc.)</td>
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<td>Mild angina pectoris</td>
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<td>Acute myocardial infarction more than 2 years previously</td>
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<td>Cerebrovascular accident with complete or almost complete recovery</td>
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* Not all replied on all points.

major splanchnic nerve joins the paravertebral trunk,” fourth, fifth or sixth thoracic—usually eighth thoracic—through first lumbar; sixth to eighth thoracic through first lumbar, and total thoracic and partial to total lumbar; celiac ganglionectomy. A surgeon and internist replied, “usually eighth thoracic through first lumbar segments; in coronary heart disease with angina pectoris from third through twelfth thoracic chains, and in certain forms of tachycardia second through twelfth thoracic.” Internists stated variously: eighth thoracic
through first lumbar paravertebral sympathetic chains; seventh thoracic through first lumbar; eighth thoracic through second lumbar; first thoracic through first lumbar and "let the surgeon decide—I favor more extensive sympathectomy"; fourth or fifth thoracic through second lumbar (third lumbar in women).

These answers show no agreement except that splanchnicectomy alone is inadvisable. There was wide disagreement on the extensive-ness of removal of the paravertebral chains which was considered advisable. Unfortunately, there is little tangible evidence which favors the effectiveness of one type of operation over another. It is unfortunate, indeed, that there have been inadequate controls but the problem of controls, as indicated previously, requires a system of case matching which is extremely difficult.

Do You Believe that Sympathectomy Is Advisable for the Relief of Headache even when the Prospects of Reducing the Blood Pressure Are Very Minimal?—Two surgeons answered with an affirmative. Three answered with "yes" provided that headache was disabling or not amenable to medical treatment and one answered "yes" provided that the patient understood the operation was palliative only. One surgeon answered "no." Two internists answered "no" and three answered "yes." Two other internists answered "yes" provided that headache was disabling and not amenable to medical treatment.

Hypertensive headache is seldom indeed disabling or cannot be relieved by medication, such as with potassium thiocyanate. It is my belief that severe hypertensive headache alone is seldom if ever an indication for sympathectomy. If there are very minimal prospects of reducing blood pressure because of advanced complications of hypertension, and headache is refractory to medical treatment of the hypertension, I favor the use of opiates or allied drugs. If there is reasonable prospect of reducing the blood pressure by sympathectomy this in itself should be adequate reason for sympathectomy; headache will almost certainly be relieved.

Do You Have Definite Evidence that Sympathectomy Increases Survival Time of Patients with Hypertension?—Seven surgeons answered "yes" to this question; one qualified his answer by the words "in malignant hypertension." One surgeon who answered "yes" expressed the view that mortality rates are reduced by sympathectomy even if the blood pressure is not reduced. Two internists answered "no"; one said that the evidence was acceptable and four answered "yes." I believe the evidence is wholly acceptable that reduction of blood pressure as a result of sympathectomy (or by any other means) increases survival time. I do not believe the evidence is wholly acceptable that sympathectomy increases survival time when the blood pressure is not reduced.

Do You Believe That Sympathectomy Produces as Good Results as the Best Medical Treatment? Better Results?—Two internists considered surgical treatment as good as the best medical treatment; an additional internist qualified his answer by saying "in many cases." One internist stated surgical treatment is better than medical treatment and one qualified his answer by the words "in many cases." A sixth internist wrote that surgical treatment was as good as medical treatment in some cases and better in others. The seventh wrote that the results of surgical treatment were better in a larger percentage of cases and the eighth replied that the question was unfair; if the results of medical treatment were good, the results of surgical treatment were not better. One surgeon stated that surgical treatment was better than medical treatment; one qualified his answer by the words "in many cases." A third had found that the results were as good in some cases and not as good in others. Another considered that the results of sympathectomy were better in cases of retinopathy, early renal damage, enlarged hearts without congestive failure and mild encephalopathy. A fifth was uncertain and another indicated that the results were better if patients did not respond to medical treatment. The seventh wrote that sympathectomy was inadvisable except for a certain group of patients who cannot be managed medically; all others should have medical treatment.

As an internist I find with others that medical treatment of hypertension is frequently entirely unsatisfactory at the time patients first
How Often Is Orthostatic Hypotension a Serious Problem after Sympathectomy?——Five internists and three surgeons answered “seldom,” “rarely,” “not a serious problem” or “practically never.” One internist replied “very often” and another “for three to six months when operation is successful.” One internist and two surgeons stated that orthostatic hypotension was troublesome for most patients for periods up to three months. Another surgeon replied “in 10 per cent.”

Orthostatic hypotension occurs almost routinely after sympathectomy. In a few instances the blood pressure is so low when patients stand that there is danger of syncope. Fortunately this can be prevented if both legs are wrapped snugly with an elastic bandage and an abdominal binder is worn; both bandage and binder can be discarded within a few weeks. Orthostatic hypotension of lesser degree may persist for many months; in many instances it is the only tangible evidence of benefit from sympathectomy. The disappearance of orthostatic hypotension remains without satisfactory explanation; there is some reason to believe that the arterioles and venules have acquired autonomy, an early manifestation of loss of benefit from sympathectomy.

Do You Shy Away from Recommending Sympathectomy for Hypertension for Patients who, in Addition, Have Anxiety Tension States (Psychoneurosis) Manifested by Nervousness, Weakness, Insomnia, Overt Anxiety and Other Somatic Complaints?——Five surgeons replied “yes” but of these two indicated that the emotional situation might be improved before operation or sometimes benefited by operation. One surgeon replied with an emphatic “no” indicating that operation improves the general condition in many instances. Four internists replied “yes” but one qualified his answer by the observation that simple tension states may be benefited and another by the observation that psychiatric care might improve the situation sufficiently to permit sympathectomy. Three internists answered “no.” My own answer to this question is “yes.” I am aware that sympathectomy frequently lessens manifestations of nervous tension. However, it has always seemed unwise to me to operate on patients for

come to me for examination. This I believe to be the true indication for sympathectomy provided there are no contraindications. In all probability, this would not be the usual situation if patients presented themselves for examination at a much earlier period in the development of their hypertension. Unfortunately some surgeons recognize little benefit from any medical treatment just as some internists take a dim view of the value of surgical treatment. These opinions are largely the result of a one-sided approach to the problem; there is benefit from surgical treatment in many cases and from medical treatment in many cases. One great virtue of sympathectomy is its expeditiousness; in many instances it is preferable to medical treatment which must be continued indefinitely.

How Often Is Pain a Major Problem after Sympathectomy for Essential Hypertension?——One surgeon answered “never”; another answered “occasionally for a few months”; another answered “infrequently”; a fourth wrote “of minor consequence” and another “rarely, my guess is 1 per cent.” Another surgeon had noted pain in 13 per cent of cases; it endured not longer than six months. One internist answered “very rarely” and another wrote “almost always” for six weeks to two to three years. Another internist considered pain a constant but variable problem; it disappeared in most instances within three months but might continue for six to twelve months. A fourth internist answered in 25 to 30 per cent and another said in 20 per cent for periods up to three months. One internist wrote “almost always”; another wrote “rarely” and another “in a small per cent for two months.”

Neuralgia following sympathectomy may be a most painful condition, distressing to patient and physician alike. Fortunately it is rarely severe and usually disappears promptly. The noted incidence of it will be sharply increased by routine questioning and recording; this probably accounts for the discrepancy in the answers reported although surgical technic may be a factor. The possibility of neuralgia should never constitute a reason for failure to recommend sympathectomy although it seems wise to inform patients that it might occur.
hypertension when the major part of their ill health stems from an emotional disturbance. I have noted that some patients with conditions mentioned in the question have prolonged periods of recovery from operation or indeed continue ill health. Certainly I would not recommend sympathectomy for such patients without capable psychiatric evaluation.

_Do You Believe that Active Duodenal Ulcer Is a Contraindication to Sympathectomy for Hypertension?_—One surgeon and three internists replied "yes" to this question. Two internists stated that the ulcer should be treated and "under control" before sympathectomy. One internist replied "no" as did two surgeons in whose experience the ulcer gave no additional difficulty after sympathectomy. Two surgeons recommended vagotomy at the time of the second sympathectomy; of these one stated that sympathectomy, vagotomy and gastroenterostomy might be advisable.

_If You Had a Patient with Unilateral Renal Disease (Urologic Examination) and Normal or Slightly Elevated Blood Urea, which of the Following Would You Recommend: Nephrectomy, Sympathectomy, or Both?_—The answers follow: Four internists and three surgeons favored nephrectomy provided that blood urea is normal and the diseased kidney markedly reduced in function or size. Two internists and three surgeons favored nephrectomy and sympathectomy and if the blood pressure is not reduced by this operation, sympathectomy on the other side. Two internists favored sympathectomy.

The problem presented by this situation is chiefly one of gaining information. If the surgeon performs both sympathectomy and nephrectomy and the blood pressure is sharply reduced, he can never be certain whether nephrectomy or sympathectomy produced the good results although unilateral sympathectomy alone is seldom beneficial. I am frequently puzzled as to the best procedure for the patient. If, on the basis of prior experience it seems most likely that the hypertension is renal in origin, nephrectomy alone is advisable. If the blood pressure remains high, bilateral sympathectomy is then recommended. If it seems unlikely although possible that the hypertension is renal in origin, sympathectomy and nephrectomy may be performed at the same operative session, followed by sympathectomy on the other side if the blood pressure remains high.

**Comment**

This study has disclosed many views and opinions and that there are disagreements about many aspects which can be resolved only by a careful plan of case matching. It seems unlikely that careful case matching will be accomplished in the future, however desirable it may be.

There is no doubt but that many patients are benefited by sympathectomy. Unfortunately no method or methods are known by which proper selection can be made in order that only those patients who will be benefited will be operated on. It is agreed that azotemia is a contraindication to sympathectomy and it seems likely that patients who have other advanced complications of hypertension respond less well than those who have compensated hypertension. It is unfortunate that many patients receive no treatment or inadequate treatment with the result that hypertension has progressed so much that no kind of treatment will reduce blood pressure. Physicians should not carry on "medical treatment" (often meaning no treatment) which gives little or no benefit until the golden period in which sympathectomy might be of benefit, has passed. It is probable that no additional technics of sympathectomy will produce better results than those currently in use. It is logical to believe that if any further contributions are made for the solution of the problem of essential hypertension, they will be medical measures. Until that time, patients who have a reasonable prospect of benefiting from sympathectomy should not be denied this surgical procedure, particularly if a short period of medical treatment does not cause satisfactory reduction of blood pressure and contraindications do not exist.
Sympathectomy for Essential Hypertension
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