TREATMENT OF HEART AND KIDNEY DISEASE AND OF HYPERTENSIVE AND ARTERIOSCLEROTIC VASCULAR DISEASE WITH THE RICE DIET *

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THE treatment of heart and kidney disease and of hypertensive and arteriosclerotic vascular disease with the rice diet is either ineffective or dangerous, unless it is done under rigidly controlled conditions. Ineffective, because small or "minimal" additions to the diet may spoil the entire therapeutic result; dangerous, because a strict observance of the diet may lead to a deficiency of vitally important elements unless care is taken that the equilibrium between intake and loss of these substances is maintained. For both reasons, therefore, continuous supervision, over a long period of time, including constant checks of blood and urine chemistry, is essential.

Rigidly controlled conditions are likewise indispensable for the evaluation of the therapeutic results. Claims of positive or negative results based on nothing but blood pressure readings for four to eight weeks before and after treatment and not substantiated by heart films, electrocardiograms, eye-ground photographs and chemical findings do not contribute much to the solution of this problem.

The same authors who a few years ago insisted that the restriction of salt, protein or fat is unwarranted in the treatment of hypertensive and arteriosclerotic vascular disease, now admit the importance of these dietary restrictions. No matter what the value of the restriction of sodium or of chloride or of protein or of cholesterol may be, the fact is: The rice diet contains less sodium and less chloride than any other diet which has been devised to reduce the sodium and chloride intake. It contains less protein than any other diet which has been devised to reduce the protein intake. It contains less cholesterol and other fat than any other diet which has been devised to reduce the cholesterol and fat intake.

The rice diet contains in 2,000 calories less than 5 gm. of fat and about 20 gm. of protein derived from rice and fruit and less than 200 mg. of chloride and 150 mg. of sodium. This does not mean that the patient's caloric intake is restricted to 2,000 calories; it varies according to whether weight gain or weight loss, protein increase or protein decrease is desirable in the individual patient.

*Read at the Thirtieth Annual Session, American College of Physicians, New York, N. Y., March 30, 1949.

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† This work was supported by grants from the A. H. Hanes Research Fund, the Life Insurance Medical Research Fund, and the U. S. Public Health Service.

Figure 1 shows a comparison of the most important constituents of the urine on a normal diet and after at least two months on the rice diet. The total nitrogen content has decreased from 15.0 gm. to 2.3 gm.; the urea nitrogen from 12.0 gm. to 1.1 gm.; the uric acid nitrogen from 0.3 gm. to 0.08 gm.; the total creatine nitrogen from 0.6 gm. to 0.4 gm.; the ammonia nitrogen from 0.6 gm. to 0.1 gm.; the sodium from 4.0 gm. to 0.01 gm. The potassium has increased from 2.0 gm. to 3.0 gm. The chloride has decreased from 7.0 gm. to 0.1 gm.; the inorganic phosphate from 1.0 gm.

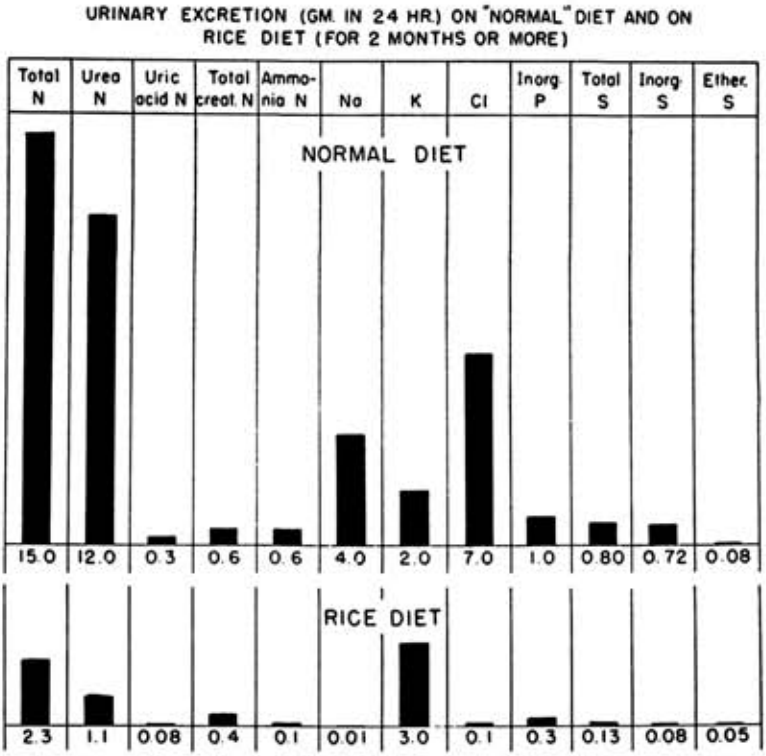

FIG. 1.

to 0.3 gm.; the total sulfate from 0.80 gm. to 0.13 gm.; the inorganic sulfate from 0.72 gm. to 0.08 gm.; the ethereal sulfate from 0.08 gm. to 0.05 gm.

The figures show that the marked decrease in the intake of nitrogen, sodium, chloride, sulfate, etc., on the strict rice diet, is followed by a marked decrease in the excretion of these substances by the kidney. Any deviation from these figures—except in rare cases—indicates that this particular diet has not been followed strictly for any length of time, and also in what way—either deliberately or unintentionally—it has been changed.

A small amount of nitrogen is also excreted through the bowels; a comparison of the daily nitrogen intake with the daily nitrogen output by stool

and urine shows that the nitrogen equilibrium on the rice diet can easily be maintained (table 1).

There are other indications that, because of the protein sparing action of the carbohydrates, the protein part of the rice diet is adequate and that there is no lack of essential amino acids; e.g., the fact that the production of hemoglobin is normal and that anemia does not develop. Also the fact that blood urea and non-protein nitrogen decrease on the rice diet whereas in starvation and in protein deficiency the body uses its own protein and the non-protein nitrogen and the urea nitrogen in the blood increase.

Other differences between starvation and the rice diet are: in starvation, the serum calcium is decreased, on the rice diet unchanged. In starvation, the plasma protein and the A/G ratio are decreased, on the rice diet unchanged or, if low before, often become normal. In starvation, the blood sugar is decreased, on the rice diet unchanged. In starvation, the carbohydrate tolerance is decreased, on the rice diet increased. In starvation, the serum phospholipids are increased, on the rice diet decreased. In starvation, the CO_2 combining power is decreased, on the rice diet increased. In starvation, the blood volume remains unchanged or—in relation to body weight—increases; on the rice diet, according to Murphy's determinations, it decreases. In starvation, the interstitial fluid remains unchanged or increases; on the rice diet it decreases. (N. B., there is no simple relationship between volume changes and clinical course.) In starvation, the excretion of total creatine bodies in the urine is unchanged; on the rice diet it is decreased. In starvation, the excretion of creatine, ammonia and organic acids is increased, on the rice diet decreased. In starvation, the excretion of total sulfate and inorganic phosphate is decreased, on the rice diet markedly decreased (table 2).

TABLE I

Nitrogen Balance After 60 Days on Rice Diet, gm.N in 24 hrs.
(Averages of 4 consecutive days)

	Intake	Output	Balance
		urine 2.61 stool 1.81	
W. C.			
m., 59	4.66	4.42	+0.24

In 490 patients with hypertensive vascular disease and an initial non-protein nitrogen of 20 to 45 mg. per 100 c.c. of blood, there was an average decrease of the non-protein nitrogen from 33 to 28 mg. per 100 c.c. of blood after an average period of 98 days. There was an average decrease of the urea nitrogen from 14 to 8 mg. (table 3). These figures are also interesting in another connection: a decreased salt intake in the diet with ensuing hypochloremia is usually followed by an increase in the blood urea nitrogen,

TABLE II

Chemical Differences between Starvation and Rice Diet

	Starvation	Rice Diet
Blood (or serum)		
Hemoglobin, RBC	Decreased	Unchanged
Calcium	Decreased	Unchanged
Total protein	Decreased	Unchanged (returned to normal if decreased before)
A:G ratio	Decreased	Unchanged
NPN	Increased	Decreased
Urea N	Increased	Decreased
Sugar	Decreased	Unchanged
Carbohydrate tolerance	Decreased	Increased
Phospholipid	Increased	Decreased
Alkali Reserve	Decreased	Increased
Blood volume	Unchanged	Decreased
Interstitial fluid	Unchanged or increased	Decreased
Nitrogen balance	Negative	In equilibrium
Urine		
Total nitrogen	Decreased	Markedly decreased
Urea N	Decreased	Markedly decreased
Creatinine + creatine	Unchanged	Decreased
Creatine	Increased	Decreased
Ammonia N	Increased	Decreased
Organic acids	Increased	Decreased
Total sulfate	Decreased	Markedly decreased
Inorganic phosphate	Decreased	Markedly decreased

and consequently by an increase in the total non-protein nitrogen. On the rice diet the salt *is* limited and the serum chlorides do decrease to a lower level. However, the restriction of the protein in the diet outweighs the effect of salt restriction and usually protects against the azotemia.

It might, perhaps, be well to talk less about the quantity of protein. The important thing is not how much protein is eaten, but how much of what kind of protein. There is actually no such thing as "protein." Proteins differ from each other in regard both to the type and the relative proportions of the various amino acids of which they are composed. They also differ in regard to rate and degree of assimilation. These differences as far as the patient is concerned are indicated by what is termed the biological value of

TABLE III

Average NPN and Urea-N of 490 Patients with Hypertensive Vascular Disease (Initial NPN 20 to 45 mg. per 100 c.c. Blood)

	Before	After 98 (Average) Days of Rice Diet
NPN (mg./100 c.c. Blood)	33	28
Urea-N (mg./100 c.c. Blood)	14	8

various proteins. It is of no advantage to the patient to receive a large amount of protein with a low biological value which cannot be properly utilized. Moreover, certain patients should use protein only for essential purposes and not merely to supply calories which can just as well be supplied by the oxidation and fermentation of carbohydrates.

The same considerations which apply to protein and essential amino acids are also valid with regard to fat and essential fatty acids. The absolute fat content of rice for instance is small, but the proportion of linoleic acid, an essential fatty acid, is high.

One of the lipids which is supposed to have an important rôle in the development of vascular disease is cholesterol. A high cholesterol concentration in the serum is frequently found in arteriosclerosis, coronary artery disease, exudative vascular retinopathy, hypertensive vascular disease, as well as in diseases of the lens and vitreous body, in uncontrolled diabetes mellitus and in the nephrotic stage of nephritis.

TABLE IV

Total Serum Cholesterol of 511 Patients with Hypertensive Vascular Disease

	Before Rice Diet	After Rice Diet	Average Period of Rice Diet (Days)
148 Patients with initial concentration below 220 mg. per 100 c.c. serum	186	171	120
363 Patients with initial concentration above 219 mg. per 100 c.c. serum	279	205	102

An easy way to produce arteriosclerosis is by feeding cholesterol to rabbits. In dogs it is not so easy. The aging process in the human species seems to be a change from the dog state to the rabbit state. The cholesterol metabolism becomes inadequate and the average serum cholesterol concentration of men of 50 is higher than that of men of 20 who have an identical cholesterol intake. However, if a 20 year old man has a disease which causes a hypercholesterolemia, the same sequelae may occur as in the 50 year old man. The literature describes cases of arteriosclerosis in diabetic children as young as one year.

We have examined the effect of the rice diet on the total serum cholesterol of 511 patients with hypertensive vascular disease (table 4). In 148 patients (29 per cent) who started the rice diet with a normal serum cholesterol, the average decrease was 15 mg. per 100 c.c. of serum after an average period of 120 days. In 363 patients (71 per cent) who had a hypercholesterolemia before the rice diet, the average decrease was 74 mg. after an average period of 102 days.

These figures show that, no matter from what fatty or non-fatty substances the cholesterol in the body is derived, and by what mechanism a high

TABLE V

Total and Free Cholesterol in Serum of 118 Patients with Hypertensive Vascular Disease (Initial total cholesterol 220–463 mg. in 100 c.c. serum)

	Before	After 56 Days (Average) on Rice Diet
Total cholesterol (mg. in 100 c.c. serum)	288	217
Free cholesterol (mg. in 100 c.c. serum)	82.2	65.7
Ratio Free: Total cholesterol (%)	27.8	30.5

serum cholesterol concentration is produced, the serum cholesterol need not necessarily remain high, as has been assumed, but can be decreased by the rice diet.

As Starke has found, both cholesterol fractions, the free and the esterified cholesterol, decrease on the rice diet (table 5). One hundred and eighteen patients with an initial hypercholesterolemia of 220 to 463 mg. per 100 c.c. of serum were examined. The total cholesterol decreased in 113 of the 118 patients. The total cholesterol did not decrease in five of the 118 patients. In the entire group of 118 patients, there was a decrease of the total cholesterol from 288 to 217 (average), of the free cholesterol from 82.2 to 65.7 (average), of the esterified cholesterol from 205.8 to 151.3 (average). In

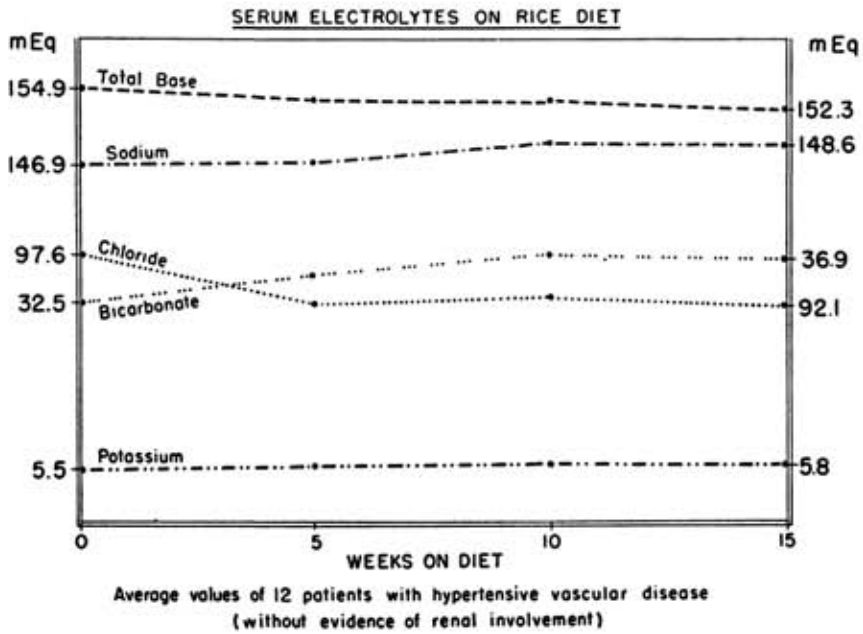

FIG. 2.

TABLE VI

Lipid Phosphorus in Serum of 42 Patients with Hypertensive Vascular Disease
(Mg. lipid P in 100 c.c. serum)

Before	After 78 Days (Average) on Rice Diet
9.91	8.87

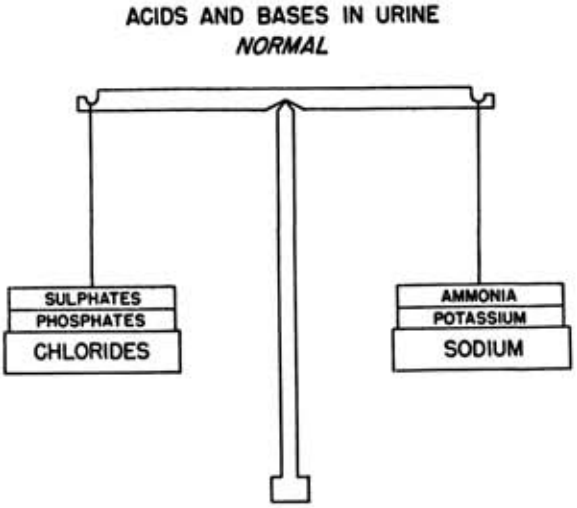

FIG. 3.

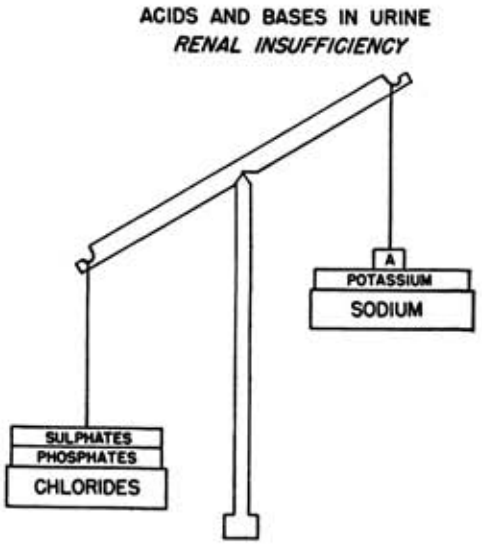

FIG. 4.

42 patients with hypertensive vascular disease, the serum phospholipids were determined. There was a decrease from 9.9 to 8.9 mg. lipid phosphorus per 100 c.c. (table 6).

Figure 2 shows the changes in concentration of sodium, chloride, potassium, bicarbonate, and total base in the serum of 12 patients on the rice diet. After an average period of 15 weeks, the serum chloride showed a definite decrease, the serum bicarbonate a definite increase; the serum sodium, potassium and total base remained relatively constant.

Another change in the mineral metabolism of patients on the rice diet is in the urinary excretion of inorganic sulfates and inorganic phosphates. The inorganic sulfate excretion decreases by 82 per cent, the inorganic phosphate excretion decreases by 62 per cent.

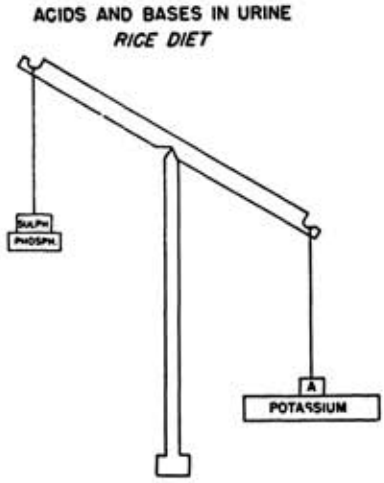

FIG. 5.

These findings are interesting for two reasons: Since phosphates and sulfates are derived mostly from protein, the decreased excretion of phosphorus and sulfur shows again that on the rice diet no endogenous protein is being broken down. Secondly, the sulfate and phosphate metabolism is important because of the acid-base balance. The scales (figure 3) represent this balance in the normal urine. The acids are on one side, the bases on the other side. In kidney insufficiency, the scale goes down on the acid side (figure 4). The kidney has lost one of its main metabolic functions: It is no longer able to form ammonia. On the rice diet, the urine chloride concentration is decreased. This does not affect the acid-base equilibrium because it is counterbalanced by the decrease in the sodium excretion. However, the potassium concentration on the base side is increased, and the sulfate and phosphate concentration on the acid side is decreased, so that even with an insufficient ammonia formation the urine becomes alkaline (figure 5).

Now let me turn from the chemical changes to the clinical changes produced by the rice diet. I will avoid long-winded statistics as much as possible and will try to discuss the main problems by showing you some typical cases as examples of what can be achieved in the individual patient.

The first case is that of a 13 year old school girl in the nephrotic stage of chronic nephritis. It is an example of the disappearance of marked generalized *renal* edema and hypoproteinemia on the rice diet. Early in Jan-

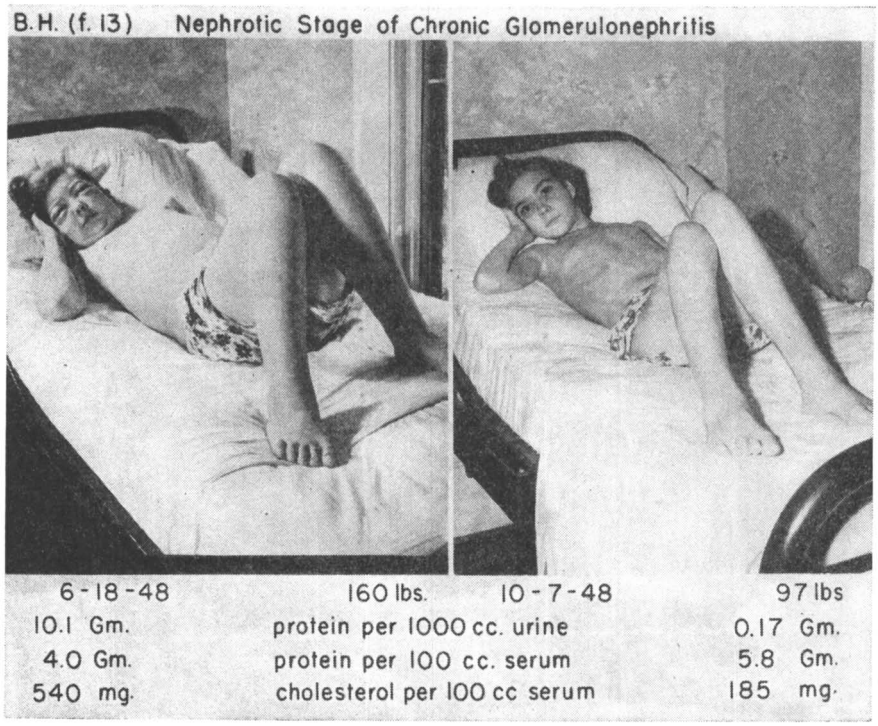

FIG. 6.

uary, 1948, this girl developed swelling of the lower extremities after a sore throat. She was treated by bed rest, salt-poor diet (for part of the time, high protein diet), and penicillin. In February, 1948, massive anasarca developed; a paracentesis was done which resulted in a weight loss of 22 pounds. Later, because of marked dyspnea, a thoracocentesis was necessary and one quart of fluid was removed from the right pleural cavity. During June, the facial edema which had been present since January became worse and the general edema and ascites increased. When the oliguria became serious, the patient was referred to us. The rice diet was started on June 18, 1948. No further paracentesis or thoracocentesis was done. The albuminuria decreased from 10.1 gm. per liter (average during the first 20 days on the rice diet) to 0.17 gm. (average after 111 to 131 days of rice diet). The

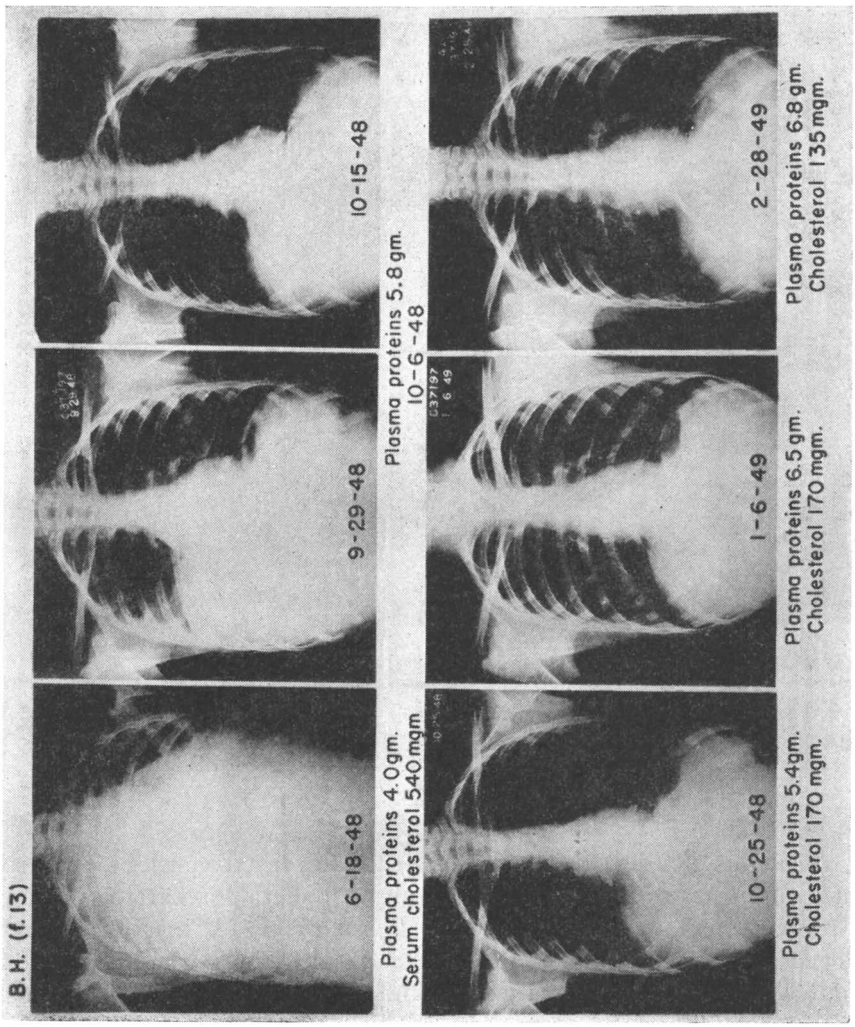

FIG. 7.

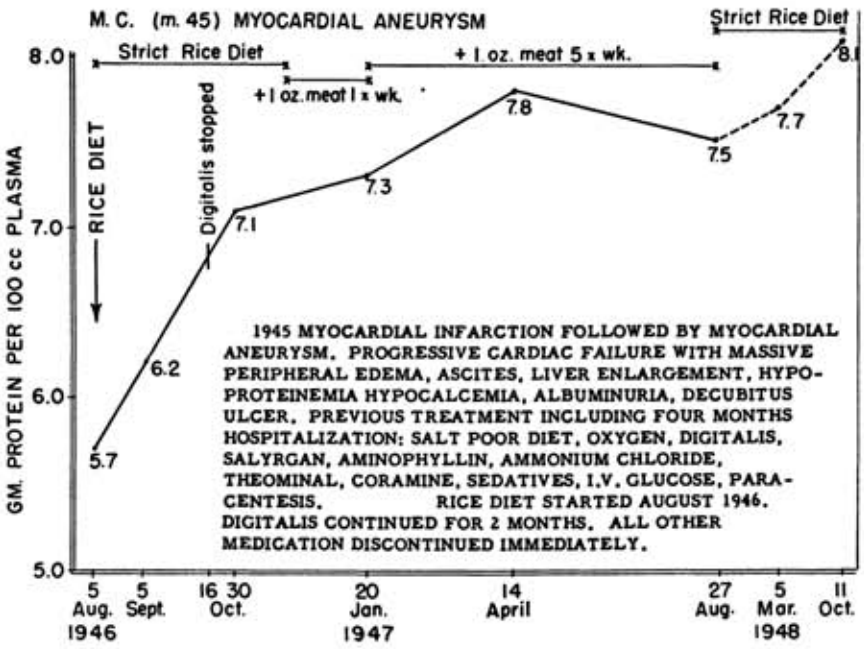

FIG. 8.

plasma protein increased from 4.0 gm. to 5.8 gm. The cholesterol decreased during this period from 540 mg. per 100 c.c. of serum to 185 mg. There was a total weight loss of 63 pounds in 15 weeks with gradual disappearance of ascites and pleural effusion. After eight months on the rice diet, the

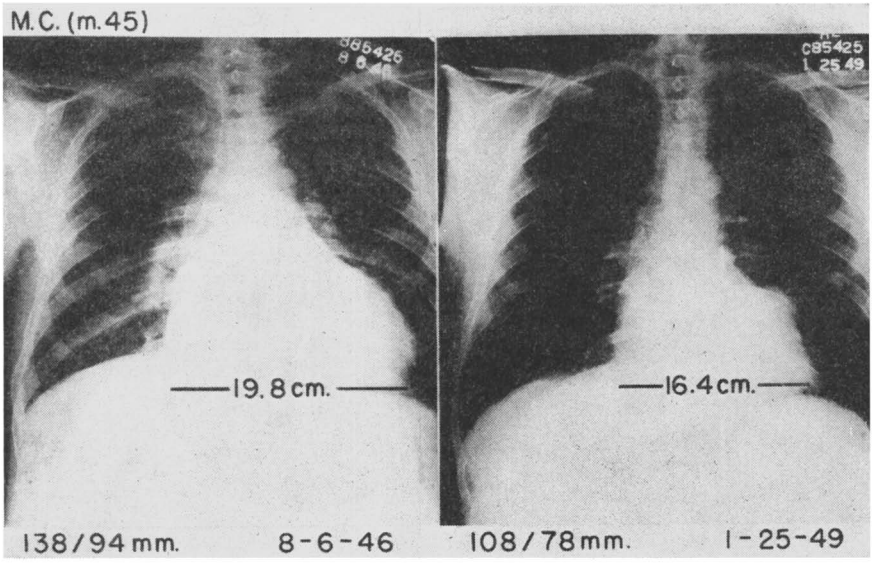

FIG. 9.

plasma protein had increased from 4.0 to 6.8 gm., the cholesterol had decreased from 540 to 135 mg. per 100 c.c. of serum (figures 6 and 7).

Figure 8 shows an example of the effect of the rice diet on the plasma protein of a patient with massive *cardiac* edema and ascites. This patient was a 45 year old man who had had a myocardial infarction in 1945. This

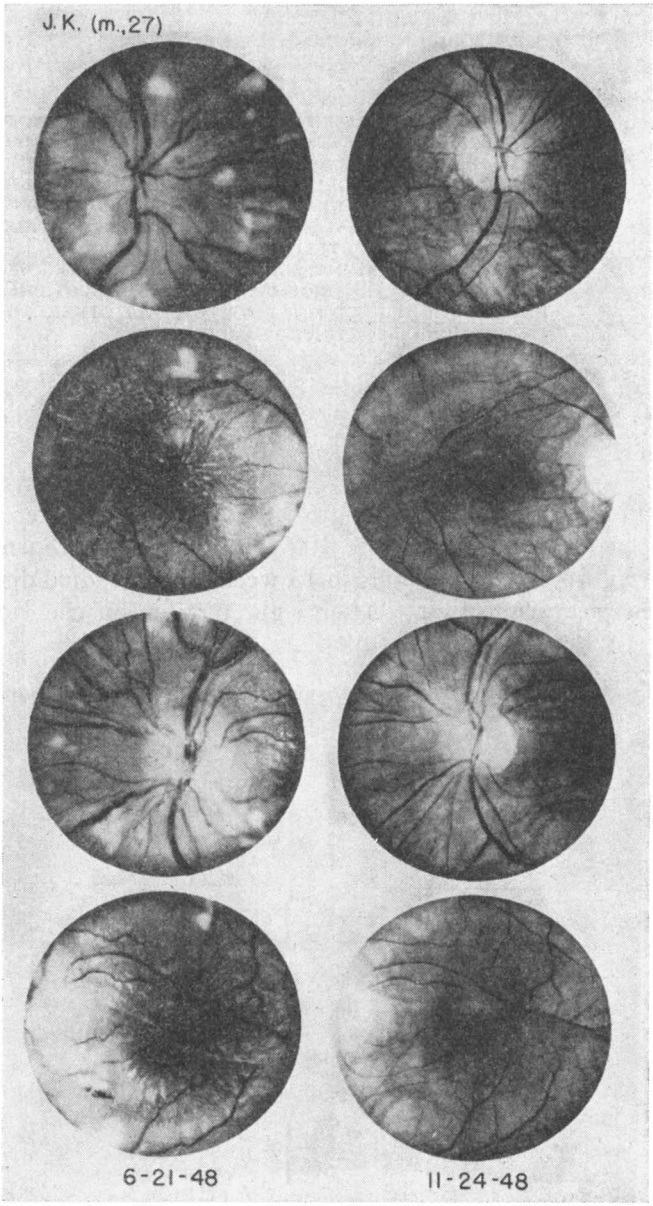

FIG. 10.

was followed by a myocardial aneurysm, progressive cardiac failure with massive peripheral edema, ascites, liver enlargement, hypoproteinemia, hypocalcemia, albuminuria, and decubitus ulcers. Previous treatment, including four months' hospitalization, consisted of salt-free diet, oxygen, digitalis, salyrgan, aminophyllin, ammonium chloride, theominal, coramine, sedatives; i.v. glucose; paracentesis. The rice diet was started August 7, 1946, and was strictly followed; a paracentesis was done August 13. Digitalis was continued for two months, but all other medications were discontinued immediately. There was a loss of weight (edema) of 50 pounds in 10 weeks. Up to the present time (two and one-half years later), the patient has received no medication; he is up and around and completely asymptomatic. The plasma proteins have increased from 5.7 gm. per 100 c.c. to 8.2 gm.

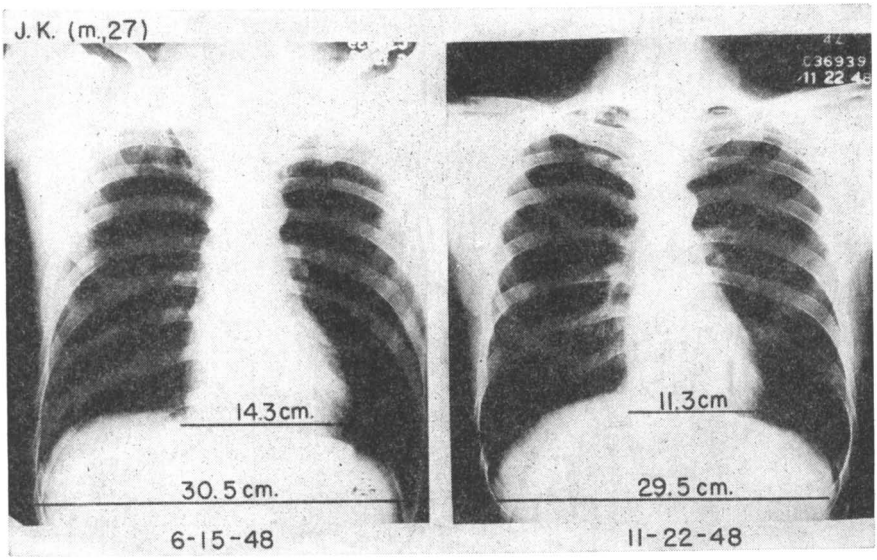

FIG. 11.

The heart is considerably smaller and the aneurysm of the posterior lateral wall of the left ventricle is now clearly visible in the A–P view (figure 9).

The patient, whose eyeground photographs and chest films are shown in figures 10 and 11, is an example of the effect of the rice diet on retinopathy and cardiac enlargement in chronic glomerulonephritis.

The patient was a 27 year old man who two years before admission to Duke Hospital, while in the Navy, had scarlet fever and acute glomerulonephritis, followed by chronic glomerulonephritis. He had been hospitalized for 16 months and treated with rest and various diets. During the month prior to admission, the patient had an exacerbation of his headache, noted blurring of vision and had a generalized convulsion, for which magnesium sulfate was given. At the start of the rice diet the blood pressure was 180

mm. of mercury systolic and 120 diastolic, the heart was enlarged, the vision considerably impaired, with bilateral marked papilledema, many hemorrhages and extensive exudates. The total phenolsulphonephthalein excretion in two hours was 7 per cent. The non-protein nitrogen was 90, the urea N 66.4 mg. per 100 c.c. of blood. The calcium was 7.8, the phosphorus 6.6, the

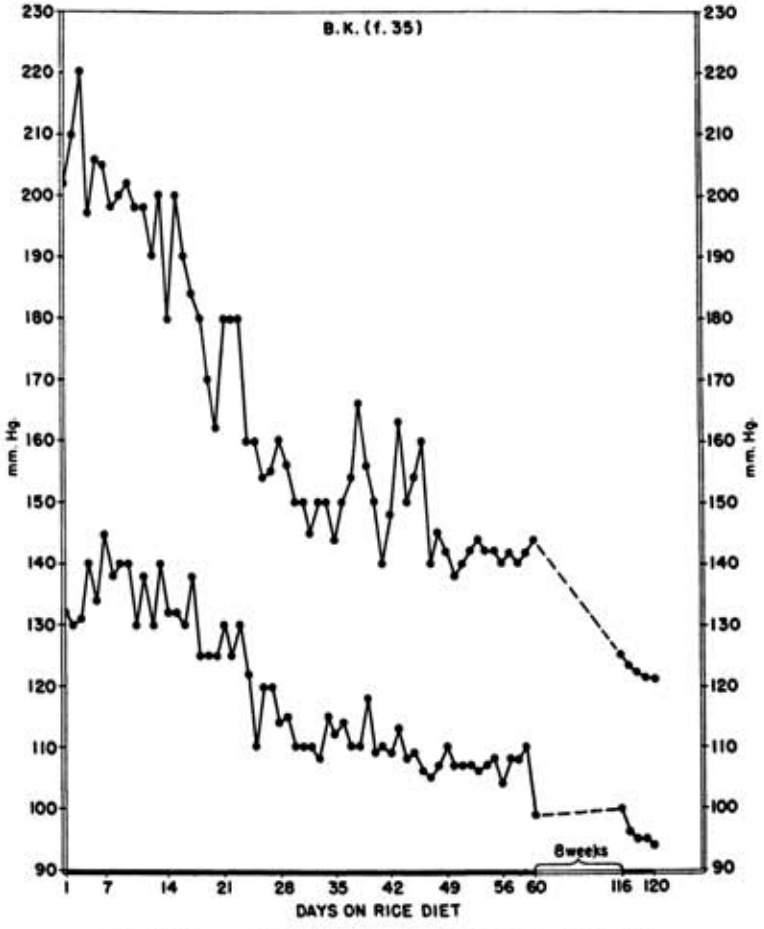

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FIG. 12.

cholesterol 350 mg. per 100 c.c. of serum. The serum chloride was 99.8 mEq. per liter.

After five months on the rice diet, the total PSP excretion in two hours was still only 10 per cent, but the NPN was 36, the urea N 15.8 mg. per 100 c.c. of blood. The calcium was 8.9, the phosphorus 5.1, the cholesterol 210 mg. per 100 c.c. of serum. The serum chloride was 88.2 mEq. per liter. The blood pressure was 137/99. The patient was asymptomatic; he had

regained his eyesight; papilledema, hemorrhages and most of the exudates had disappeared; the heart had decreased in size with a change in the transverse diameter of 27 per cent.

I have shown you some effects of the rice diet on edema, ascites, heart enlargement and retinopathy in patients with primary kidney disease. I will show you now some characteristic examples of the effect of the rice diet on hypertensive vascular disease without evidence of any primary renal disease. In more than 70 per cent of 777 patients most of whom were seriously ill and had failed to respond to other forms of treatment, the rice diet, given for periods of four to 1,150 days (average 92 days), has proved beneficial; that means that it has produced one or more of the following effects: decrease in the sum of systolic and diastolic blood pressure of at least

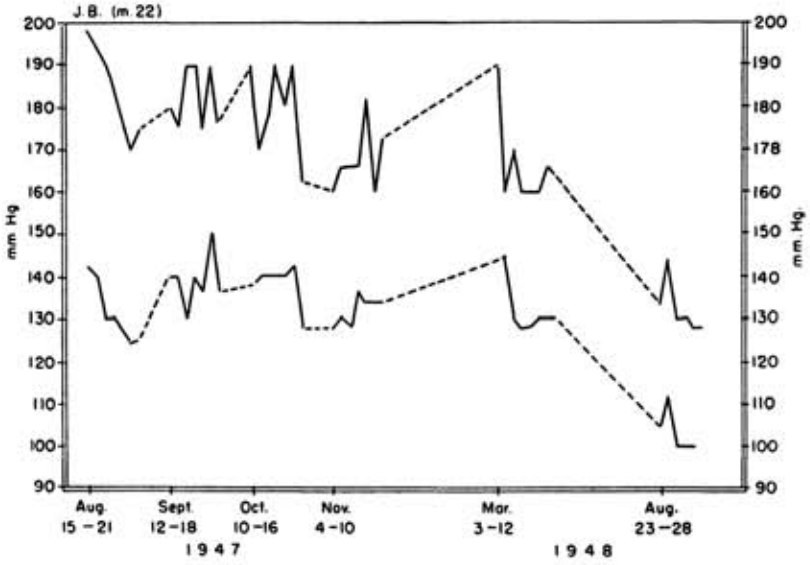

FIG. 13.

40 mm. Hg; reduction in heart size with change in the transverse diameter of 18 per cent or more; change in T_1 from completely inverted to upright; disappearance of severe retinopathy.

I will begin with three typical cases of so-called benign essential hypertension without serious cardiac, renal or retinal complications.

The first one is an example of a satisfactory response to the diet in about four months. It is the case of a 35 year old woman who had had hypertensive vascular disease for 11 years. There was no evidence of any renal excretory involvement. Of two brothers with hypertensive vascular disease, one had died of a stroke at the age of 37. For years, the patient did not feel up to par with increasing fatigue and exhaustion. There was a sensation of pressure and throbbing in the back of the head and in the eyes. From January to April, 1947, because of the appearance of retinal hemor-

rhages, rutin, vitamin K and sedatives were given; all activities had been severely restricted.

The patient began the rice diet in April, 1947. All medication was discontinued. On the first day of the diet, the blood pressure was 202/132; after three weeks of the diet the blood pressure was almost as high as before: 180/132. After 120 days, the blood pressure was 122/95 (figure 12). It has remained at this level until the present time (two years) in spite of the

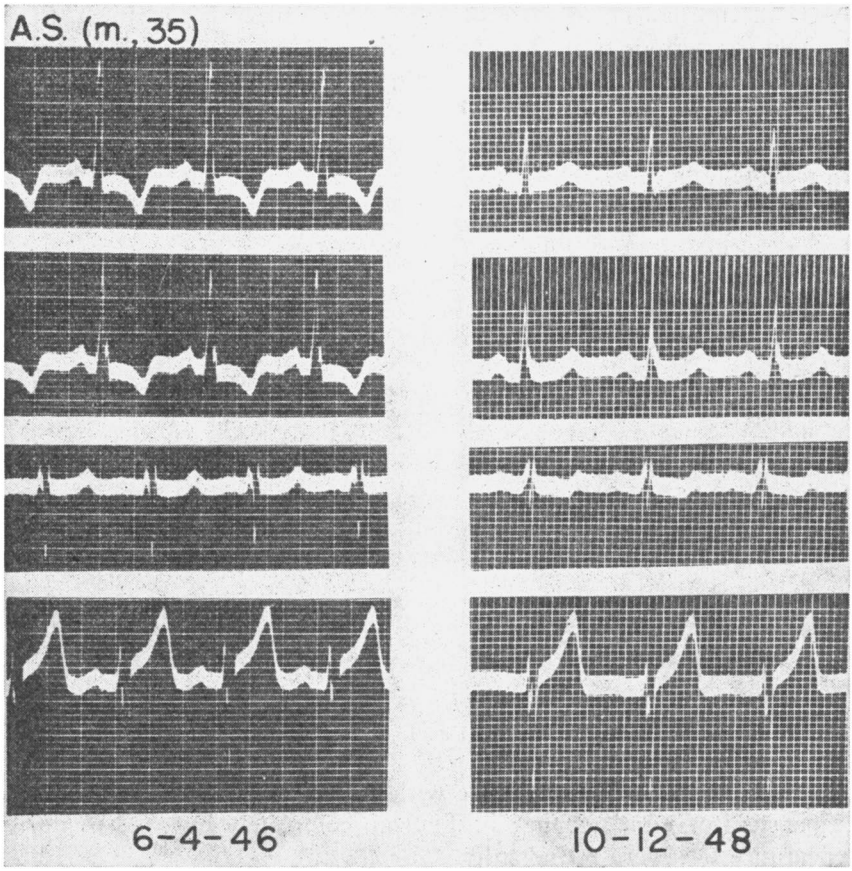

FIG. 14.

fact that two ounces of meat, one potato, 9 oz. of vegetables, one cup of coffee per day and 2 oz. of vegetable oil, 4 oz. of spaghetti per week, have been added to the diet. The patient has resumed her activities and is completely well.

The second case is an example of a rather slow response of hypertension to the diet. It is the case of a 22 year old man with benign essential hypertension without any history of kidney disease or evidence of renal excretory dysfunction. The patient had known about his hypertension for six months.

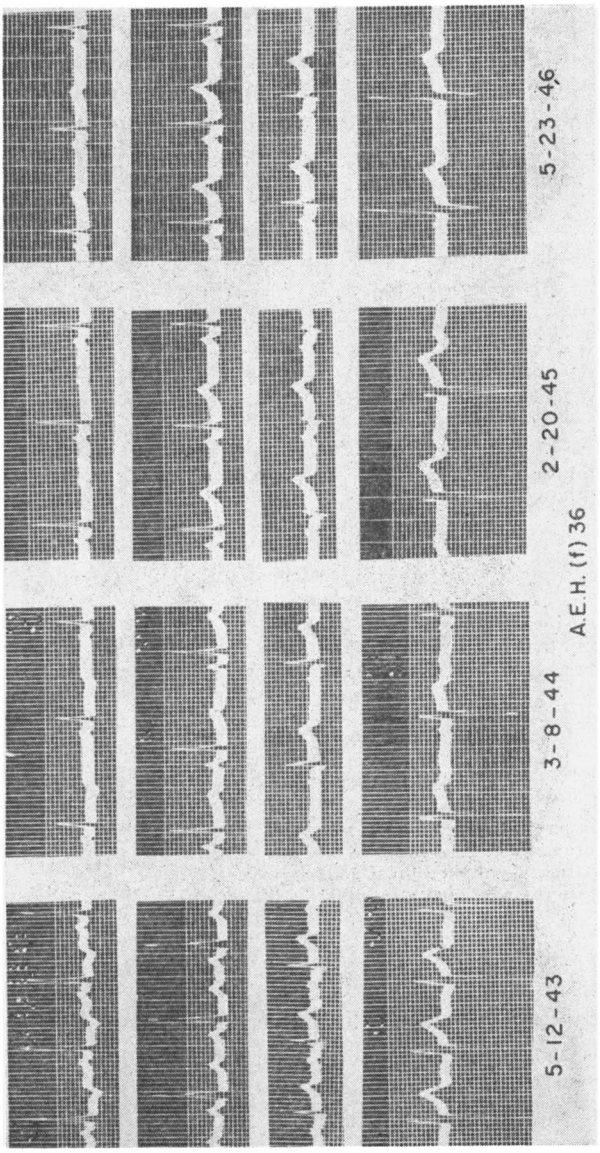

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FIG. 15.

He was asymptomatic except for intense headaches. He was started on the rice diet in New York. Since the blood pressure did not change in seven and one-half weeks, he came to Durham. During August, September and October, 1947, while he was staying in Durham continuously, the blood pressure remained persistently at a level of 170 to 190 systolic and 130 to 145 diastolic; the headache, however, disappeared. When the patient returned for reëxamination in November, 1947, and March, 1948, the blood pressure was as high as before. From June, 1948, on, i.e., *12* months after the rice diet was started, his physician in Alberta noticed that the blood pressure was decreasing. When the patient returned to us in August, 1948, after 14

TABLE VII

Blood Pressure Response According to Length of Time of Treatment

	Number of Patients	Percentage	Average Period on Rice Diet (Days)
4–1150 Days			
Total	777		92
Blood pressure not improved	226*	29%	72
Blood pressure improved	551	71%	101
4–74 Days			
Total	392		37
Blood pressure not improved	151**	38.5%	32
Blood pressure improved	241	61.5%	40
75–1150 Days			
Total	385		149
Blood pressure not improved	75***	19.5%	153
Blood pressure improved	310	80.5%	148

* Including 33 patients who died after 48 days (average).
** Including 25 patients who died after 32 days (average).
*** Including 8 patients who died after 100 days (average).

months on the rice diet, the blood pressure was as low as 128/100 (figure 13).

The shortest time in which we have seen a marked blood pressure decrease on the rice diet was four days. The average time is about three to four months.

Table *7* shows the positive and negative results of treatment in *777* patients with hypertensive vascular disease who followed the rice diet for four to 1150 days (average 92 days). There was a definite decrease of the blood pressure level in 71 per cent of the total group. The average of this decrease was from 198/116 to 150/96 in 101 days. If one differentiates the results according to the length of time the patients have been following the

diet, the importance of the time factor becomes obvious: In 392 patients who followed the diet for four to 74 days (average 37 days), there was a definite lowering of the blood pressure in 62 per cent. In 385 patients who followed the diet for 75 to 1,150 days (average 149 days), there was a definite lowering of the blood pressure level in 81 per cent.

The third case with benign essential hypertension is an example of a satisfactory response to the diet in one month. It is the case of a man now 47 years old who was well until he was 37. In March, 1940, he was seen in the New York Hospital. The blood pressure was 165 to 200 systolic and 105 to 135 diastolic. A diagnosis of hypertensive vascular disease was

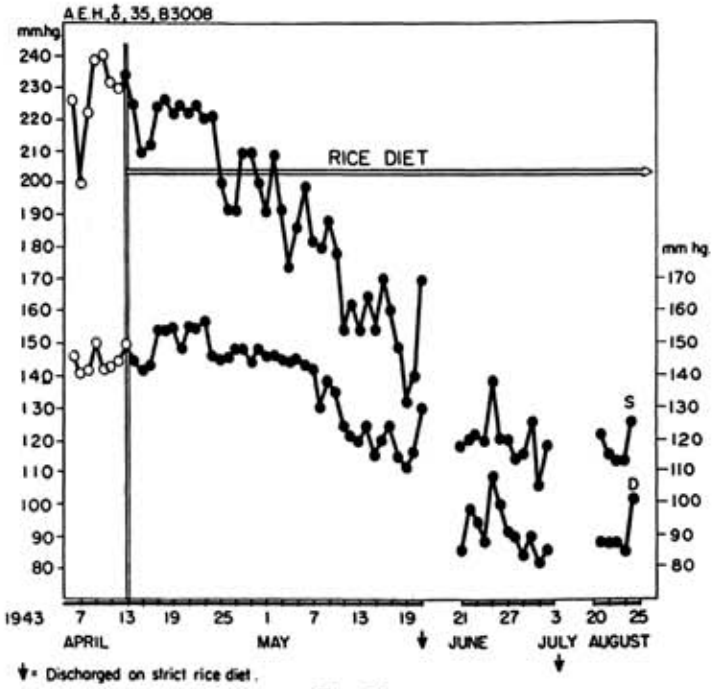

FIG. 16.

made. In January, 1941, he was seen in the Presbyterian Hospital. The blood pressure was found to be 200/140. One month later, the patient was seen in the Rockefeller Hospital with a blood pressure of 200/140. He was treated there by Dr. Henry Schroeder with tyrosinase until this had to be discontinued because of a severe shock-like reaction. As a matter of fact, this was the last patient whom Dr. Schroeder treated with tyrosinase. I like to show his record because Dr. Schroeder in the *American Journal of Medicine* in April of last year made the statement that the control periods preceding the rice diet might be too short to get an accurate base line for studying the effect of the diet. As is true for the majority of my patients, the base line for this patient was recorded by good observers not only over

a period of weeks or months but over a period of years. In this particular case, there are not only the figures of the New York and Presbyterian Hospitals but also those of Dr. Schroeder himself. After the tyrosinase treatment had failed, the patient went to Dr. Smithwick in Boston, where a lumbodorsal sympathectomy was done.

The sympathectomy did not help this patient. The blood pressure figures 14 months after the operation were even slightly higher than before. In 1945, the patient had a therapeutic trial with testosterone with no result. In March, 1945, when he came to us, he had tightness around the heart, headaches and swimming in the head. He had difficulty in walking and complained about a tendency to go toward the left and had at times run into

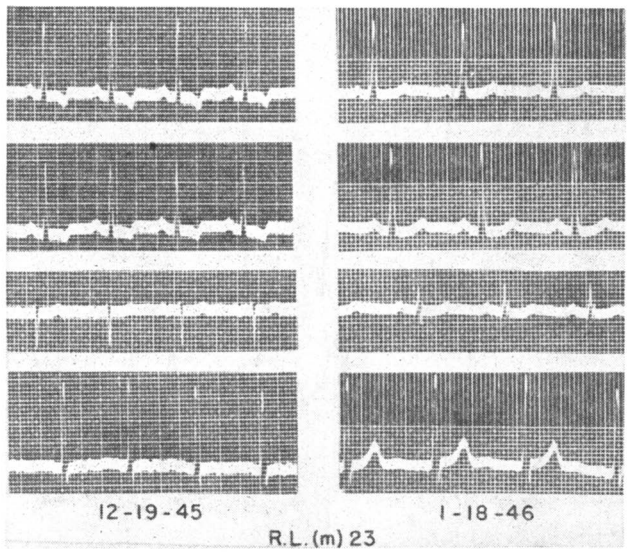

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FIG. 17.

walls. The blood pressure was 220/132. The average of daily blood pressure readings during 20 days while he was in the hospital on a 1,500 calorie diet was 197/129. No evidence of renal excretory dysfunction was found. PSP and urea clearance tests were normal. The rice diet was started on April 20, 1945. The blood pressure after one month of diet was normal and has remained normal to the present time. On February 24, 1949, it was 114/82. The diphasic T_1 in the electrocardiogram reverted to normally upright in seven months, and has remained upright since. The heart became smaller in size with a change in the transverse diameter of 12 per cent. The patient who was a sick man when he came to us in 1945, is now—four years later—well and active.

Patients such as these three, with so-called benign essential hypertension

are frequently told not to be concerned about their disease, unless some complication develops.

I believe the most appropriate time for treatment is before the more incapacitating complications of the disease have developed (cardiac breakdown, cerebral accidents, loss of vision and renal insufficiency). However, I will show you some typical electrocardiograms, chest films and eyeground photographs, which will illustrate that hypertensive vascular disease can be compensated to a great extent even when critical complications are already present.

Figure 14 shows the reversion of an abnormal electrocardiographic pattern to normal in a 35 year old man with hypertensive vascular disease of

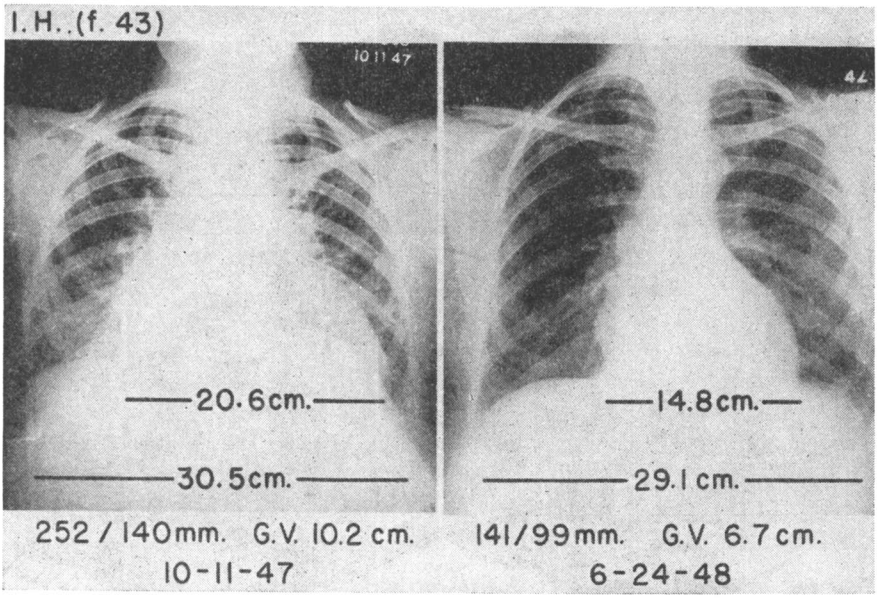

FIG. 18.

less than three years' duration. The change in the electrocardiogram is seen after 26 months on the rice diet. The blood pressure during this time decreased from an average of 205/122 to 150/103. Retinal hemorrhages and exudates disappeared. The deeply inverted T_1 became upright; the electrical axis improved.

Figure 15 illustrates the time factor in the gradual improvement of T_1. The patient was a 35 or 36 year old woman. Hypertension was known to be present for about one year. In May, 1943, T_1 was deeply inverted; in March, 1944, T_1 was low inverted; in February, 1945, low upright; in May, 1946, normally upright. This case also shows that there is neither a simple relationship between blood pressure drop and T_1 improvement nor between reduction in heart size and T_1 improvement. The blood pressure decreased

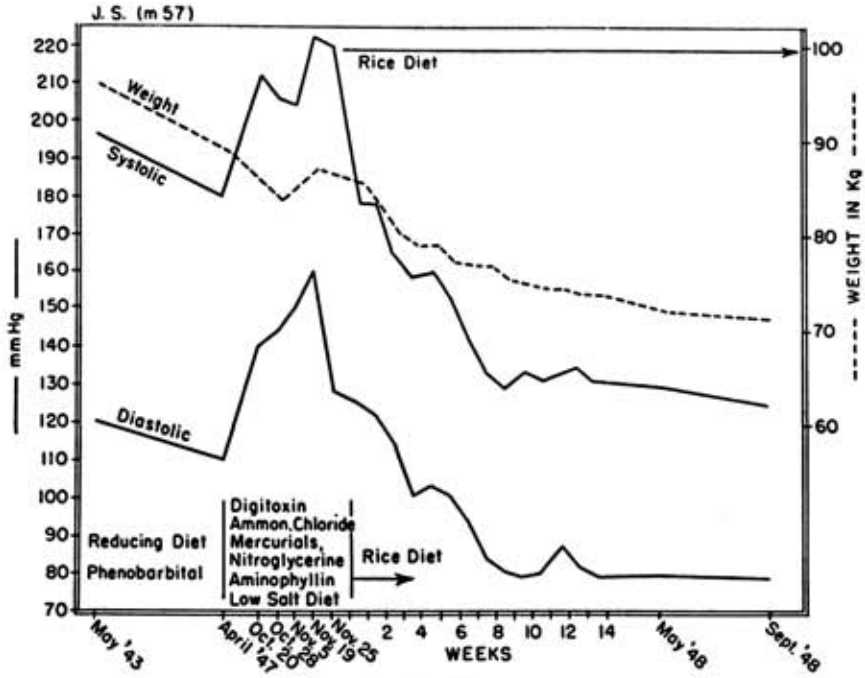

FIG. 19.

TABLE VIII

Changes of T_1 in 520 Patients with Hypertensive Vascular Disease after Rice Diet

Number of Patients	T_1 Before Rice Diet	T_1 After Rice Diet	Period on Rice Diet (Average)
	No Change (388)		
68	Inverted	Inverted	7 months
34	Diphasic	Diphasic	8 months
286	Upright	Upright	11 months
	Change in direction to inverted (10)		
0	Upright	Inverted	
5	Diphasic	Inverted	8 months
5	Upright	Diphasic	4 months
	Change in direction to upright (122)		
38	Diphasic	Upright	9 months
32	Inverted	Diphasic	13 months
52	Inverted	Upright	10 months

from 220/150 to 124/85 (figure 16) and the heart became normal in size within 10 weeks on the rice diet. Three years were required for the inverted T_1 to become normally upright.

Figure 17 shows the reversal of an inverted T_1 in the shortest period of time we have seen, one month. It is the electrocardiogram of a 23 year old man with hypertensive vascular disease, uncomplicated for three years, in the malignant phase with severe neuroretinopathy for three months. During the first month of the rice diet in which T_1 became normal, the blood pressure

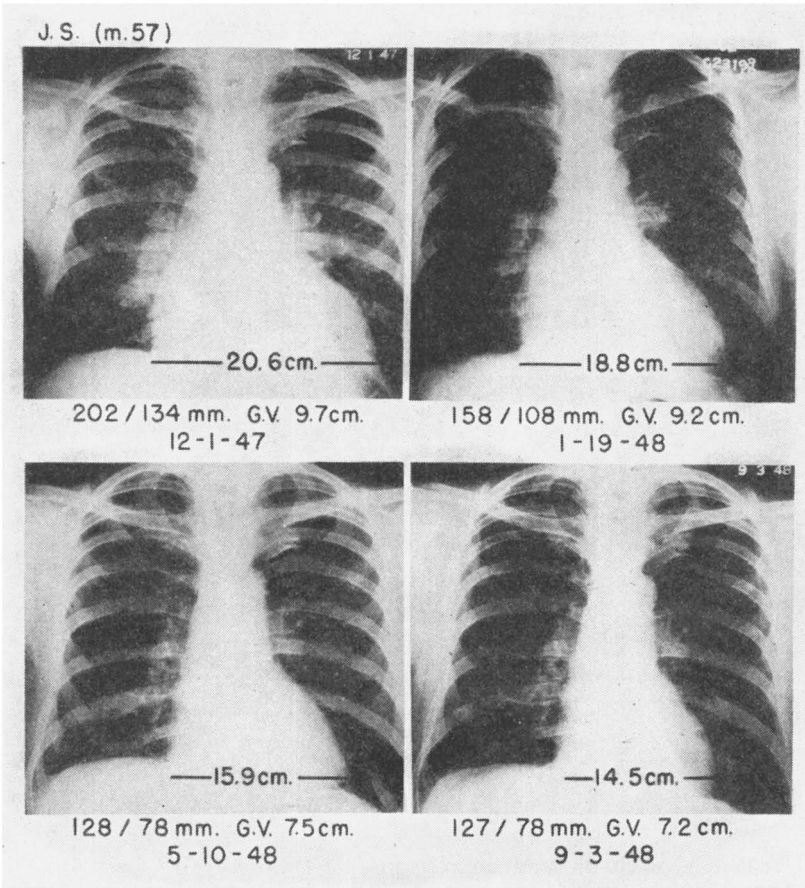

FIG. 20.

level decreased from an average of 222/148 to an average of 153/112. A normal blood pressure was reached only after two more months on the diet.

The T waves in Lead I were evaluated in 520 patients. None of these patients received digitalis or any other drug. All electrocardiograms were made with the patient at rest and in recumbent position. In 286 electrocardiograms which were normal at the start and in 102 electrocardiograms

which were abnormal at the start, no change occurred. In 132 electrocardiograms, a change did occur. In 10 in the direction from normal toward inverted. In 122 in the direction from abnormal to upright (table 8).

Figure 18 shows two chest films as an example of the reduction in heart size produced by the rice diet. It is the case of a 43 year old woman who had had hypertensive vascular disease for 14 years. It remained uncomplicated for 11 years. Then auricular fibrillation and heart failure developed with liver enlargement, edema, dyspnea and substernal pain. The

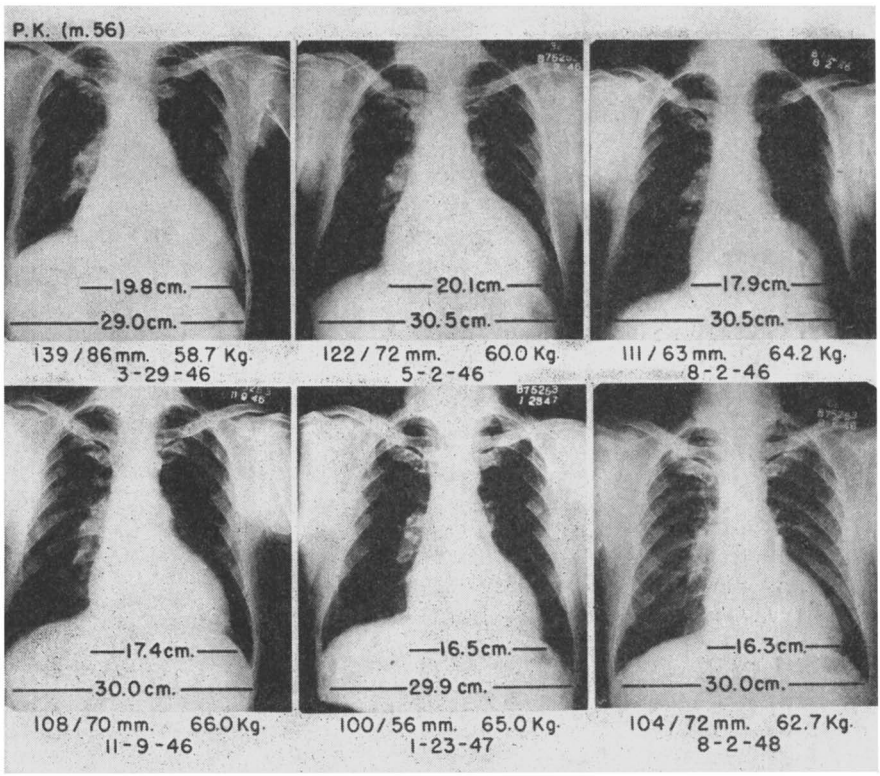

FIG. 21.

usual treatment with dietary restrictions, rest and digitalis was given with no improvement. Within eight months on the rice diet, the blood pressure decreased from 252/140 to 141/99, and the heart became smaller in size with a change in the transverse diameter of almost 40 per cent. The patient became asymptomatic and is now doing rather strenuous work.

The next case is an example of the length of time required for a heart which is enlarged and disfigured by the disease to change its size and shape back towards normal. The patient was a 57 year old man who had known he had hypertensive vascular disease for four years. Hypertensive heart

disease had become apparent in April, 1947. It was treated with digitoxin, ammonium chloride, mercurials, nitroglycerin, aminophyllin, weight reduction, salt-restricted diet. In spite of this medication and a weight loss of 30 pounds, the blood pressure increased and the heart failure became worse. When the patient came to us, the rice diet was started, and all medication including digitalis was immediately discontinued. The edema disappeared in 20 days; the blood pressure returned to normal in two months (figure 19). A decrease in heart size was noted after six weeks with a change in the transverse diameter of 8.7 per cent; after five months there was a change of 29 per cent; after nine months there was a change of 42 per cent (figure 20).

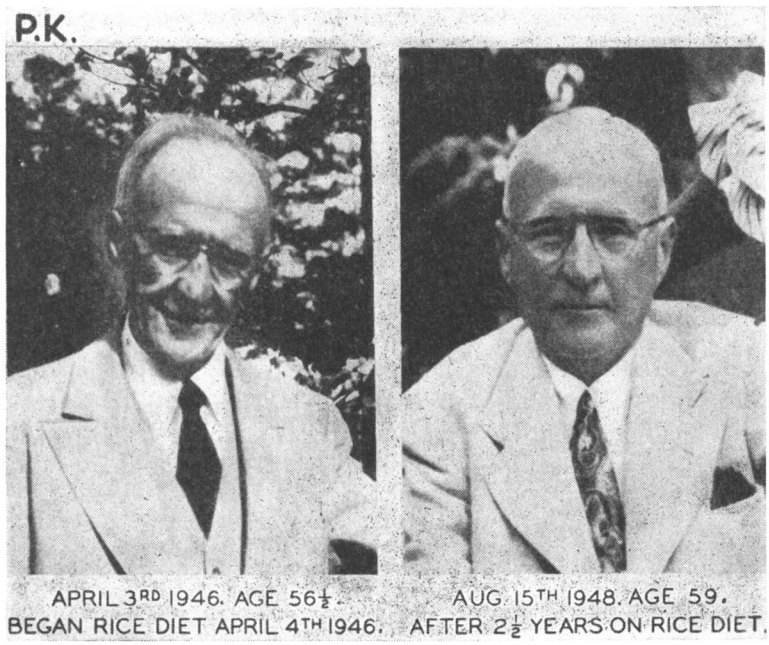

FIG. 22.

The patient became completely asymptomatic and has been without any medication for the past 14 months.

Chest films of 286 patients taken before and after one month or more of dietary treatment were measured for comparison (no digitalis or other drugs were given after the day the first chest film was taken). In 15 of the 286 patients (i.e. in 5 per cent), the heart became larger with an average increase of 2.6 per cent. In 146 patients there was a decrease in heart size with a change in the transverse diameter of 6.2 per cent (average), in 106 patients there was a decrease with an average change of 14.2 per cent and in 19 patients a decrease with an average change of 24.4 per cent (table 9).

I do not think that the improvement in the electrocardiographic pattern or the decrease in heart size or the disappearance of papilledema, hemor-

TABLE IX

Effect of Rice Diet on Heart Size: Average Changes in Transverse Diameter of Heart in 286 Patients with Hypertensive Vascular Disease

	Change		Average Period of Rice Diet (days)
	Diameter of Chest %	Transverse Diameter of Heart %	
15 patients with *increase* of 0–8.0%	+0.8	+ 2.6	184
146 patients with *decrease* of 0–9.9%	−0.7	− 6.2	112
106 patients with *decrease* of 10–19.9%	−0.3	−14.2	114
19 patients with *decrease* of 20% or more	−2.2	−24.4	187

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rhages, and exudates in the eyegrounds occurs as a simple consequence of a decrease in blood pressure. I have seen quite a few patients in whom these improvements have occurred in spite of the fact that the blood pressure remained at exactly the same level as before. They, likewise, occur in the many instances where vascular retinopathy and/or heart enlargement are present without hypertension.

Figure 21 is an example of the compensation of heart failure and the reduction of heart size in a patient who had gone through a fairly complete list of therapeutics. When he came to us in March, 1946, he was 56 years old. He had had nephrolithiasis and had developed hypertension and hypertensive heart disease. Nephrectomy on the left side was done in 1940 in

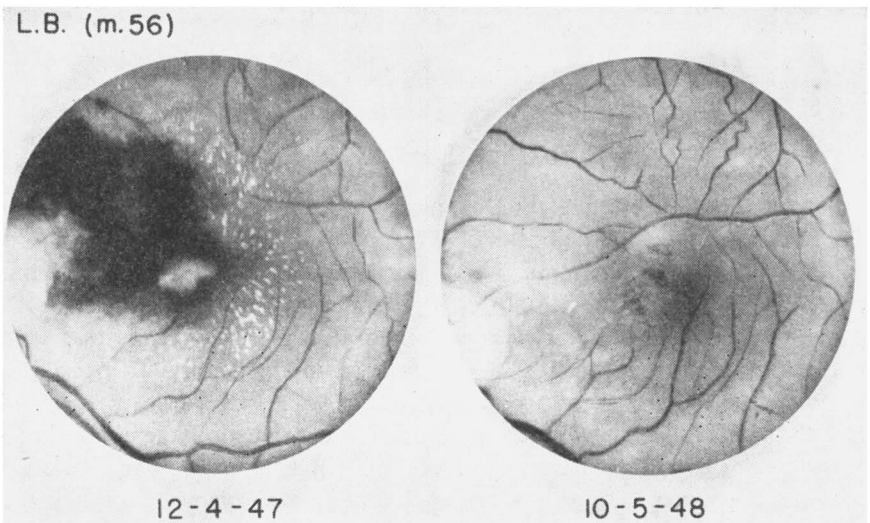

FIG. 23.

the hope of arresting his vascular disease. In spite of this, the disease continued and a left bundle branch block developed. When heart failure gradually increased, digitalis, squill, mercupurin, ammonium chloride, sedatives and salt-poor diet were tried.

The first chest film of March 1946, showed a greatly enlarged heart. There was edema, liver enlargement, and ascites. All medication was immediately discontinued and the rice diet started. Five weeks later the transverse diameter of the heart was 3 mm. larger, but the patient had lost most of his edema and was no longer dyspneic. The patient ate one pound of rice (dry weight) and one pound of dextrose daily and gained over 7 kg. during

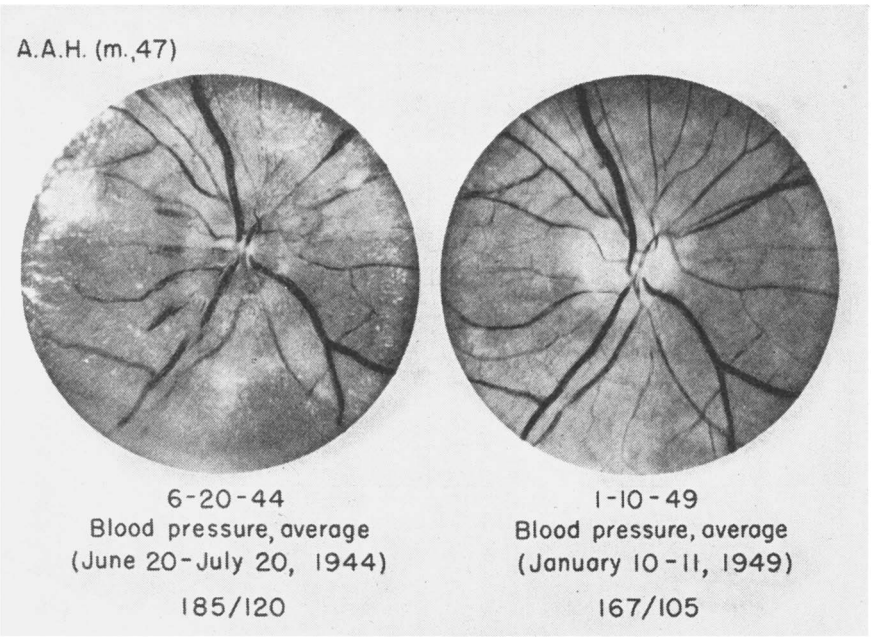

FIG. 24.

seven months in spite of the loss of edema. Four months after the start of the diet the transverse diameter of the heart had decreased from 19.8 to 17.9 cm.; after seven months from 19.8 to 17.4 cm.; after 10 months from 19.8 to 16.5 cm. No medication has been given for the past three years. The patient is feeling well and is completely asymptomatic. The transverse diameter of the heart is now 16.3 cm., which means an overall change of more than 20 per cent. I showed the patient these heart pictures, boasting about the result. In return, the patient sent me a Christmas card with pictures of his face "before and after the rice diet" (figure 22). They are perhaps not uninteresting even from our mechanistic point of view. The first photograph shows the characteristic face of a patient with advanced heart disease,

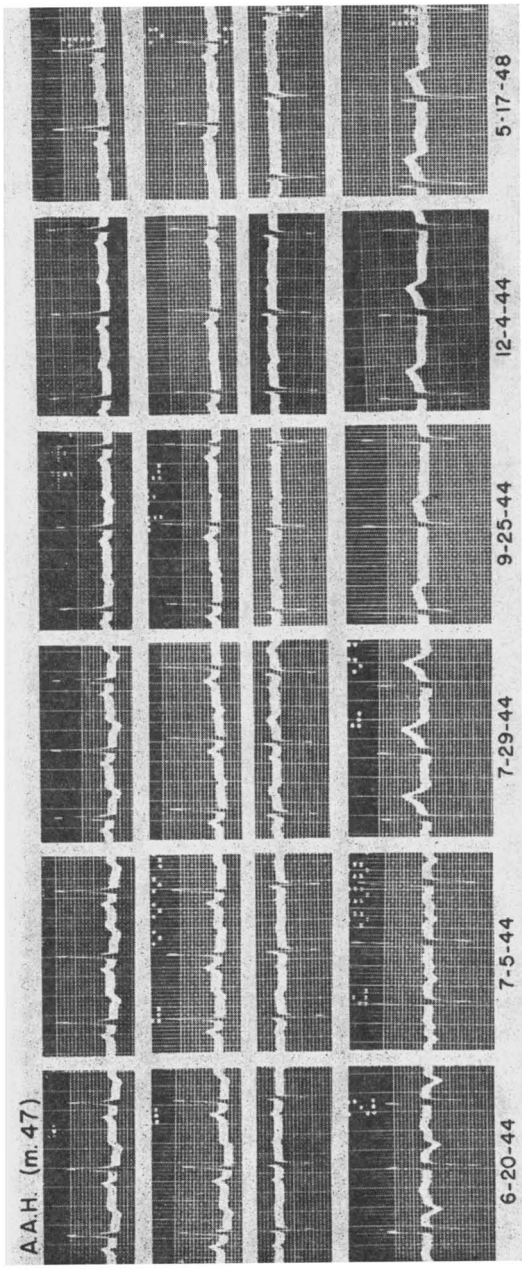

FIG. 25.

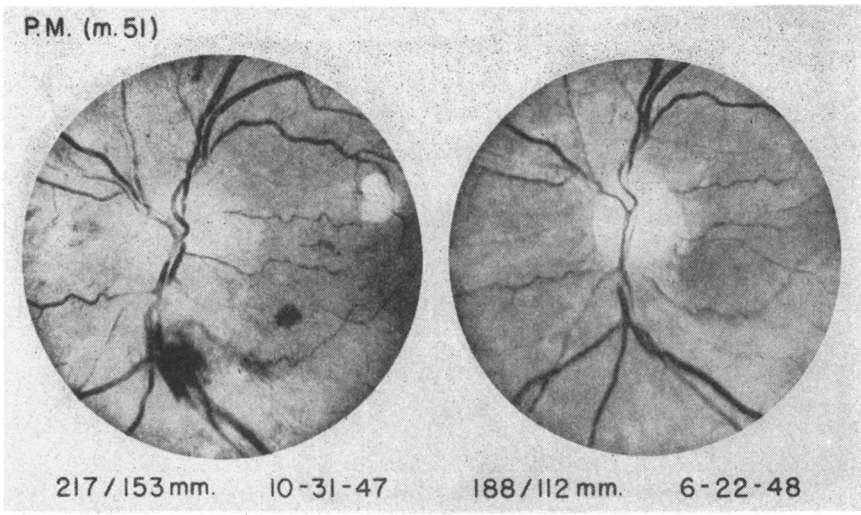

FIG. 26.

drawn, emaciated, prematurely aged, like that of a victim of starvation. The second photograph shows a well nourished, healthy man: one might say that the face has gained what the heart has lost.

Vascular retinopathy responds to the rice diet just as well as myocardial disease. The improvement of the retinopathy occurs no matter whether the blood pressure decreases or not.

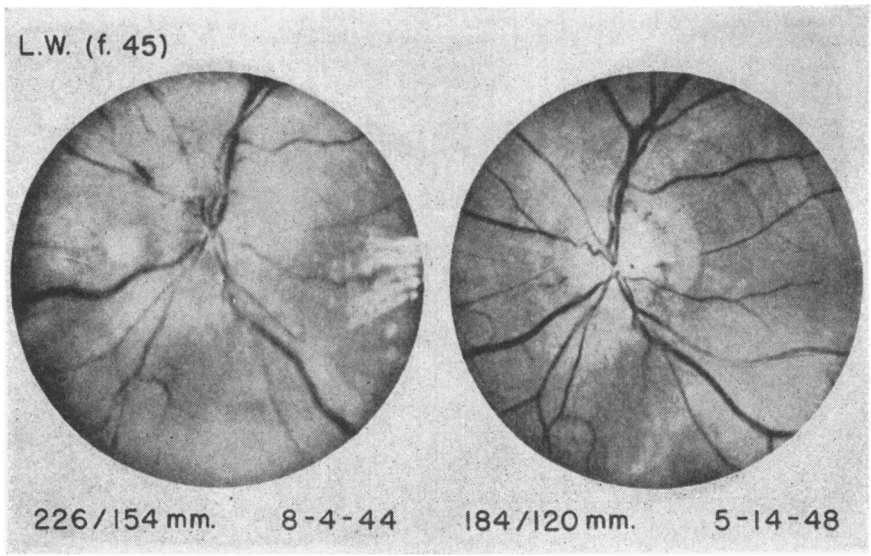

FIG. 27.

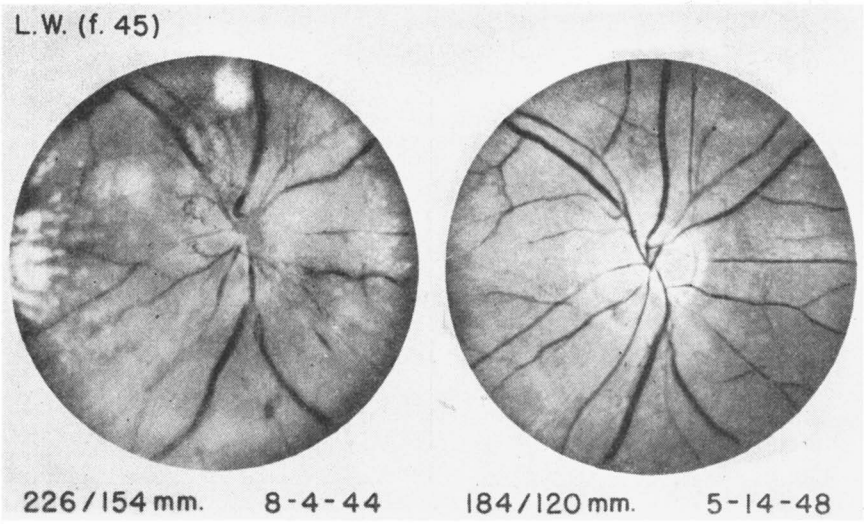

FIG. 28.

The eyeground pictures of three cases are shown as examples of the disappearance of papilledema, exudates, and hemorrhages, in spite of persistent hypertension. The first patient is a 56 year old man with hypertensive vascular disease which had been uncomplicated for 10 to 15 years. One month before he came to us he became blind in his left eye. The pictures (figure 23) show the disappearance of massive hemorrhages and exudates in 10 months on the rice diet. The patient regained his eyesight and is now well and active. The blood pressure has decreased but is still not normal.

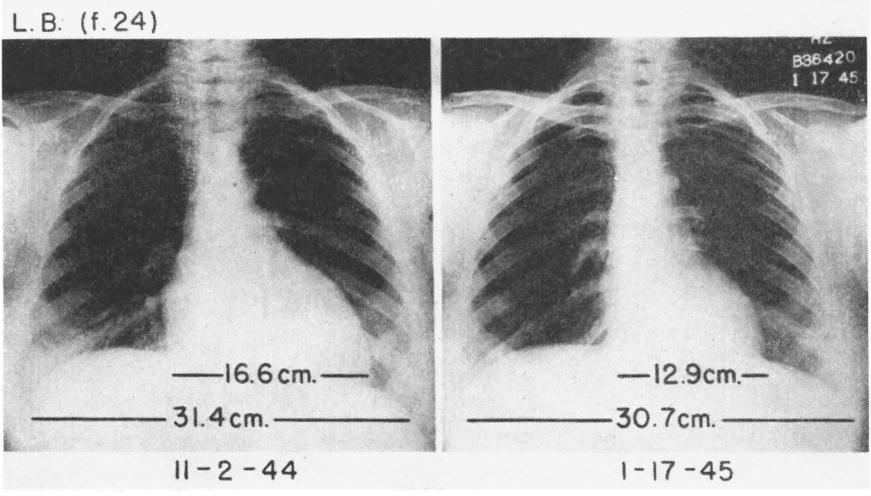

FIG. 29.

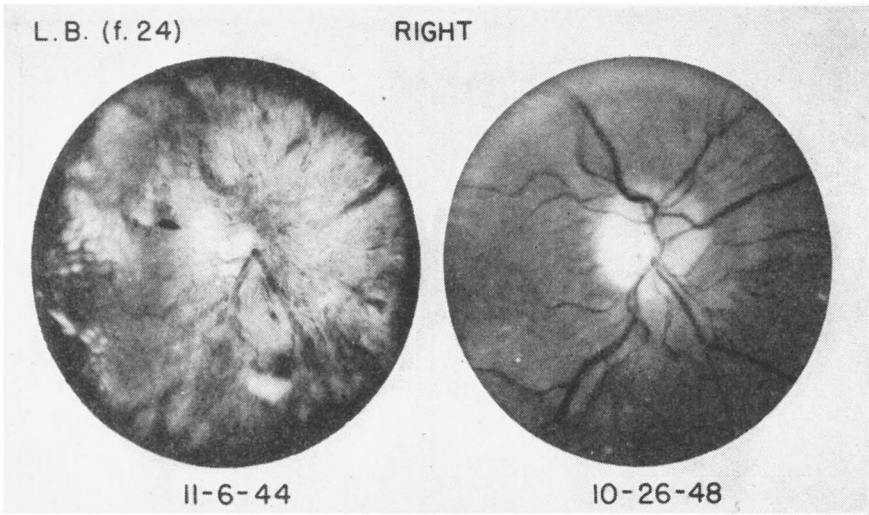

FIG. 30.

The second case is that of a man who was 47 years old when he came to us almost five years ago. He had been suffering from periodic attacks of severe headaches for years, but had known of his hypertension only for three months. He had not been conscious of any impairment of vision until I asked him to close his left eye and he found he was unable to read the headlines of a newspaper with his right eye. In one and one-half years of treatment with the rice diet, the exudates in the macula disappeared. The papilledema and hemorrhages cleared up completely and the eyesight was restored

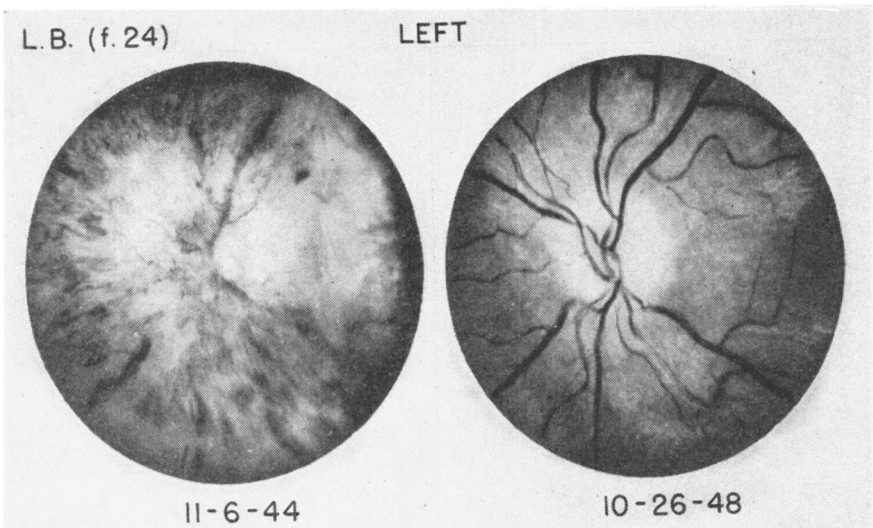

FIG. 31.

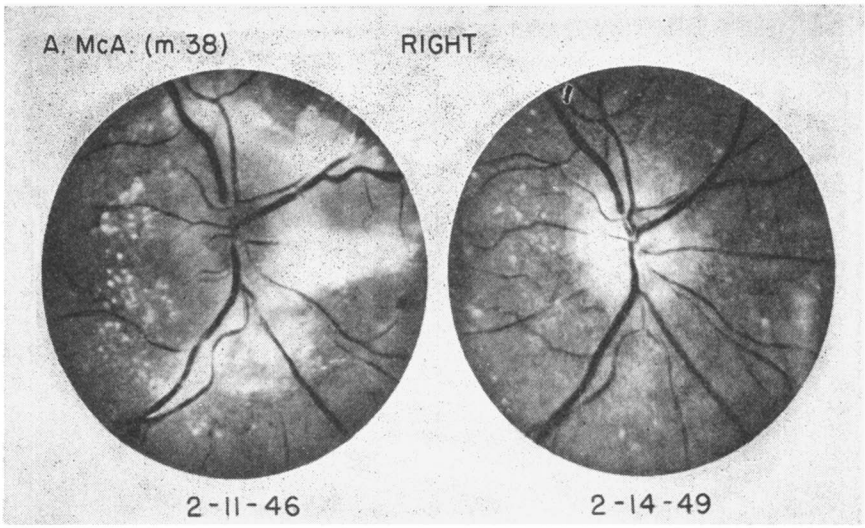

FIG. 32.

(figure 24). The heart, which was involved, also improved; the inverted T_1 in his electrocardiogram became normally upright (figure 25). The blood pressure has decreased but is not normal.

The third patient is a 51 year old man with hypertension known for 10 years. He had had progressive heart failure for seven months. There was hypertensive neuroretinopathy with papilledema, hemorrhages, and exudates, which cleared up in eight months on the rice diet (figure 26). The blood pressure did not become normal, but dropped from 217/153 to 188/112.

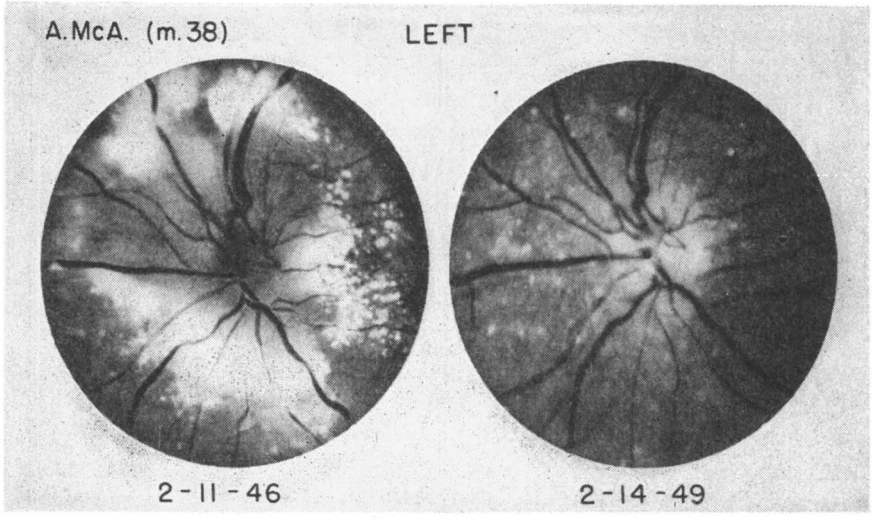

FIG. 33.

I have shown you pictures of patients who had essential hypertension with severe complications. We classify this type of hypertension as benign because of its slow course, although the term benign may lose its sense when the patient becomes blind from retinal disease or when he dies of heart failure, myocardial infarction, cerebral vascular accident or uremia. Moreover, the possibility always exists that any benign vascular disease may suddenly change into the malignant form. The last three patients whose eyeground photographs I showed you presented some of the signs said to be characteristic of malignant hypertension, the high diastolic blood pressure and

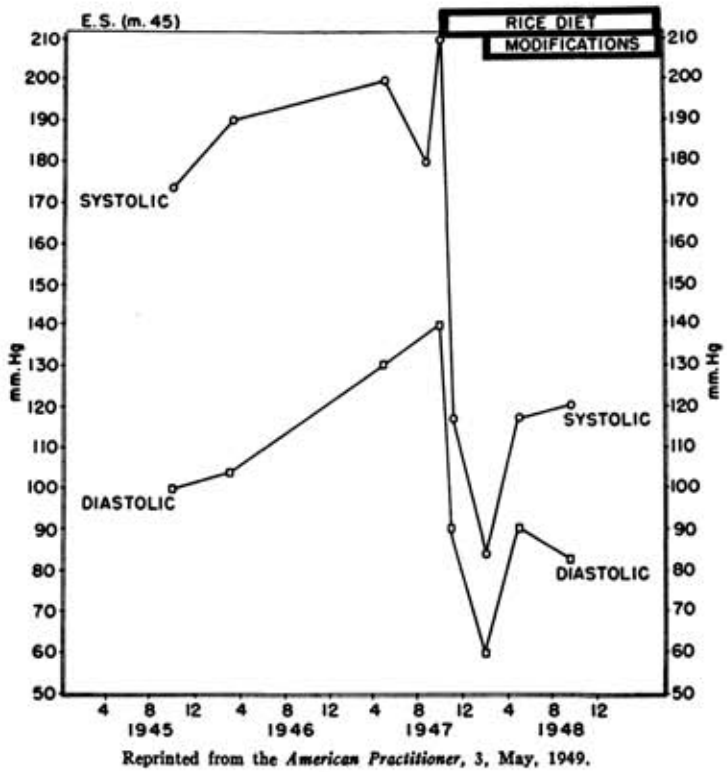

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FIG. 34.

papilledema, hemorrhages and exudates. However, the eyegrounds did not show the picture of the explosive retinopathy which we associate with true malignant hypertension.

The following photographs are shown as examples of the effect of the rice diet on patients with full blown malignant hypertension.

The first case is that of a 45 year old woman who came to us in 1944 with a history of hypertension of four months' duration, apparently malignant from the onset. The eyegrounds show the typical picture of malignant neuroretinopathy. The patient followed the strict rice diet for one

year, then a modified rice diet. The blood pressure decreased from a level of 226/154 to a level of 184/120. The retinopathy healed completely (figures 27 and 28). Not only did the patient not die but after more than four and one-half years she is up and around and has no complaints.

The second patient is a 24 year old woman who had had an uncomplicated hypertension for five years. This benign hypertension had become malignant one month before she came to us (October, 1944). In 24 days on the rice diet, the blood pressure decreased from 233/157 to 118/80. The heart became smaller in size with a change in the transverse diameter of 22 per cent in 11 weeks (figure 29). Papilledema, hemorrhages and exudates disappeared in about three months. As the eyeground pictures of October, 1948, show, the retinopathy did not recur (figures 30 and 31). The

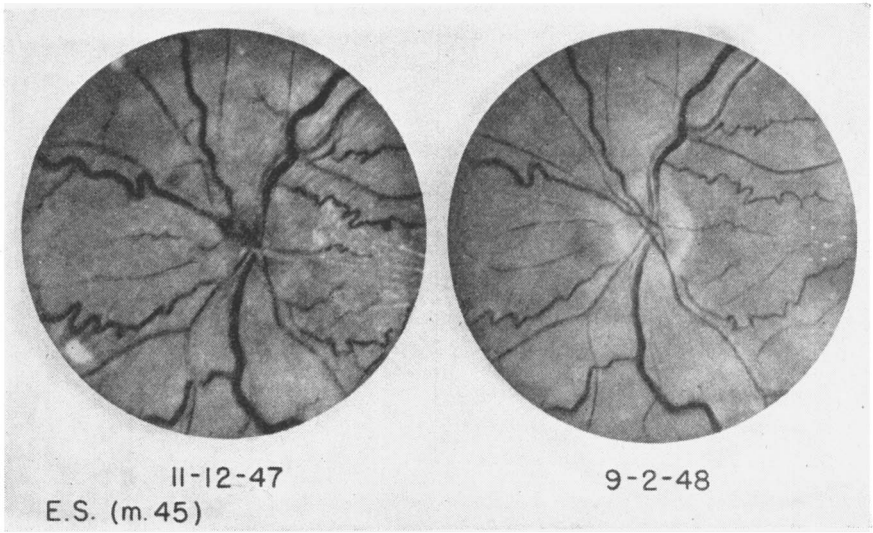

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FIG. 35.

patient not only did not die of her malignant hypertension, but after more than four years is now well and doing strenuous work on her farm.

The third patient is a 38 year old man who had had hypertensive vascular disease for one year. The hypertension had been obviously malignant for about three months before he came to us. This case has been chosen as an example of a rather slow response to the rice diet. Definite improvement of the extensive neuroretinopathy was not seen until after one year. The inverted T_1 in the electrocardiogram did not become upright until after two and one-half years, and it took almost three years for the blood pressure to come down to a significantly lower level (figures 32 and 33).

As a kind of summary, let me end with a case which shows not only the success but also the possible dangers of the rice diet. The patient, a busi-

ness man from New York, had had periodic check-ups since 1932 when he was 30 years old. The blood pressure had always been normal until 1941 when a slight elevation was noted. It climbed slowly during the following years. In 1945, it was 170/100, in 1946 190/100, in the Spring of 1947 190/130. In spite of this, the patient was completely asymptomatic. Both family physician and consultant specialist advised treatment with weight reduction, rest, sedatives and restriction of smoking. In September, 1947, the patient suddenly developed a severe headache with visual disturbances and consulted an ophthalmologist who found retinal hemorrhages, exudates, and papilledema and made a diagnosis of retinopathy of malignant hypertension. Another medical specialist was consulted who found a blood pressure of 202/144, confirmed the diagnosis of malignant hypertension and sent

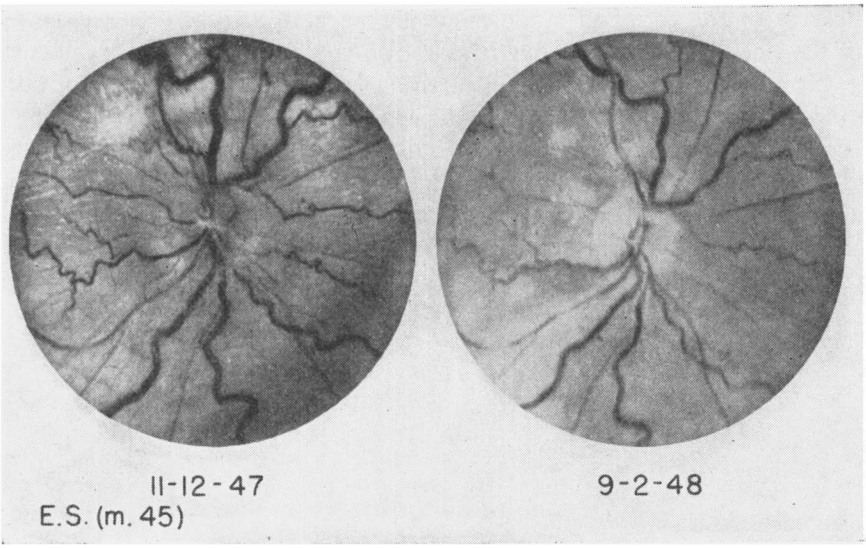

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FIG. 36.

the patient to a surgeon in the New York Hospital for sympathectomy. The surgeon made the same diagnosis and recorded the same findings. After eight days of observation, a sympathectomy was scheduled for Monday, October 27, 1947. The evening before the operation, the patient decided to try the rice diet first and came to Durham. He presented the typical picture of malignant hypertension. The blood pressure was 210/140, in spite of sedatives; the eyegrounds showed extensive neuroretinopathy. On the rice diet, the blood pressure decreased rapidly. As a matter of fact, it decreased so much that after three months the patient had a blood pressure of 85/58 while lying and 60/30 while standing. A marked hypochloremia with elevation of urea nitrogen and non-protein nitrogen was found and the diet had to be modified greatly by the addition of toast, meat and all kinds of vege-

tables. The blood chemistry returned to normal and the blood pressure was regulated at a level of 110/77 within two weeks (figure 34). All the signs and symptoms of the malignant hypertension have disappeared; papilledema, retinal hemorrhages and exudates have cleared up completely; the engorged and tortuous veins are smaller in caliber and straighter (figures 35 and 36). However, not only the malignant but also the benign hypertension has disappeared. The blood pressure, which had been above normal for six years, is now (one and one-half years after the start of the rice diet) 116/76, although the patient has resumed playing his 18 holes of golf and eats a fairly liberal diet.

Ten years ago, I used to teach, what was generally taught and is still written in textbooks published as late as 1947, that the presence of advanced neuroretinopathy in malignant hypertension is an ominous prognostic sign indicative of the terminal stage of an irreparable disease. My experience with the rice diet has taught me that not only can so-called benign hypertensive vascular disease be effectively treated even when critical complications are present but also that malignant hypertension, in spite of advanced neuroretinopathy, may either be changed into the benign form of hypertension or made to disappear completely. The important result is not that the change in the course of the disease has been achieved by the rice diet but that the course of the disease can be changed.