The following line ration scheme meets the requirements both of the busy doctor and the patient. The doctor has only to divide the patient's weight by a factor to be able to prescribe the correct rations for the day, and two minutes suffice for all the necessary instructions to the patient. Thus treatment can be commenced outside an institution, and no preliminary starvation is involved now that insulin can take its place. The scheme is shown in the appended table. Each complete line is called a ration and consists of a standard amount of carbohydrate, protein, and fat. The diet is prescribed as so many lines, or rations, a day. To calculate the appropriate number of rations the physician has only to divide the body weight in pounds by 16 (16.5 is more exact). Thus if a man weighs 165 lb. he will get 10 rations—that is, ten lines a day. (Unlike the schoolboy, the worse the diabetic the fewer "lines" he ultimately gets.) Each line is divided into two parts: the first half-line containing the carbohydrate and the second half-line the protein and fat. Any first half-line can be combined with any second half-line to make a ration. The number of rations a day is divided as desired between the different meals with regard to when insulin is given and other considerations. Suppose a patient gets three rations for breakfast: he can take $3\frac{1}{2}$ oz. milk, $1\frac{1}{3}$ oz. bread, and 4 oz. tomato (three first half-lines containing carbohydrate), and one egg and $2\frac{1}{2}$ oz. of fat as butter and 2 oz. of bacon (three second half-lines, one of which has been taken twice). Thus the patient can choose his own food. The method is accurate and the lines exact in food value, with the exception of milk, whose content in protein and fat has been neglected for simplicity. The food values used are those of the food tables of Harrison and Lawrence, which are an average from all known authorities. The weight of cooked foods is given unless otherwise stated. The scheme has been planned on the following theoretic considerations.

The common successful practice is adopted of giving diets of low total calorific value composed of low carbohydrate, moderate protein, and high fat content. The proportion of carbohydrate to fat is such as to avoid appreciable acidosis (ketosis), the proportion of fatty acids to glucose being as 1.5 is to 1, as in Woodyatt's formula.² I aim at giving 1 gram of protein per kilogram of body weight (about $1\frac{1}{2}$ gram per lb.). This is more than many of the American school advocate, but giving less makes a miserable allowance from the patient's point of view. Each ration or line contains 5 grams of carbohydrate (the first half-line), 7.5 grams of protein, and 15 grams of fat (the second half-line). If we give 1 gram of protein per kilogram of weight, a man of 75 kg. will get 75 grams of protein a day. Now each ration contains 7.5 grams of protein, so that $75 \div 7.5 = 10$; this is the number of rations for a man of 75 kg. It is the same thing to divide the weight in pounds—165 by 16.5 (7.5 kg. = 16.5 lb.). Now if we make protein the starting point and look upon it as unity (1 gram of protein per kilogram), the proportion of a ration is 0.66 gram of carbohydrate, 1 gram of protein, and 2 grams of fat, which equal 25 calories. Hence it follows that if we are giving 1 gram of protein per kilogram and the carbohydrate and fat are in the proportion arranged in the line, the total diet will also provide 25 calories per kilogram of body weight (11 calories per lb.). Thus it happens that the weight in kilograms divided by 7.5 (or pounds by 16.5) will always give us the number of rations that provide a diet of 25 calories per kilogram of body weight with the carbohydrate, protein, and fat in proper proportion.

The diet of 25 calories per kilogram is low, but makes a good starting point in the treatment. If the patient becomes sugar-free on it the diet can be raised later. If he does not become sugar-free with nearly normal blood sugars at the end of a week, insulin must be given. If the patient is losing weight and energy higher diets can be prescribed by dividing the body weight by other factors. The number of rations to provide a diet of 30, 35, or 40 calories can be calculated by dividing the body weight in pounds by 13.5, 11.8, or 10.3 respectively, the resulting diet still having the proper proportion of carbohydrate and fat to avoid acidosis, but the protein becoming more than 1 gram per kilogram. If this is undesirable, the extra calories can be added to the 25 calorie diet by giving extra carbohydrate and fat in the proportion of one first half-line to $1\frac{1}{2}$ or 1 oz. of fat—depending on whether the patient tolerates fat well or not. But a few patients may find this confusing, and the harmful effect of slightly increased protein is not clearly proved. Each line ration contains 190 calories, so that another method of calculating the number of rations a day is to divide the total calories desired by 190—1,900 calories being contained in ten rations.

THE "LINE RATION" DIET SCHEME.

Any first half-line added to any second half-line = one ration.

First Half-lines.		Second Half-lines.	
Milk	 $3\frac{1}{2}$ oz.	One egg and fat	$2\frac{1}{2}$ oz.
*Bread	 $1\frac{1}{3}$ oz.	Bacon	1 oz.
*Oatmeal (raw) or biscuit	 $1\frac{1}{4}$ oz.	Ham	1 oz. and fat $1\frac{1}{4}$ oz.
Cabbage or greens	 $5\frac{1}{2}$ oz.	Kipper	$1\frac{1}{2}$ oz. and fat $1\frac{1}{2}$ oz.
*Tomato (raw or cooked)	 4 oz.	Herring	1 oz. and fat $1\frac{1}{2}$ oz.
*Potato	 $3\frac{1}{4}$ oz.	Lean meat or mutton	1 oz. and fat $1\frac{1}{2}$ oz.
Cauliflower or French beans	6 oz.	Lean lamb or veal	1 oz. and fat $1\frac{1}{2}$ oz.
Brussels	 5 oz.	Lean pork	1 oz. and fat $1\frac{1}{2}$ oz.
Spinach or asparagus	 6 oz.	Chicken	1 oz. and fat $1\frac{1}{2}$ oz.
Turnip or carrot	 4 oz.	Tongue (tinned)	1 oz. and fat $1\frac{1}{4}$ oz.
Onions, leeks, or marrow	 $3\frac{1}{2}$ oz.	Liver	1 oz. and fat $1\frac{1}{2}$ oz.
Beetroot	 $2\frac{1}{2}$ oz.	Kidney or tripe	$1\frac{1}{2}$ oz. and fat $1\frac{1}{2}$ oz.
Lettuce (raw)	 6 oz.	Rabbit	$2\frac{1}{2}$ oz. and fat $1\frac{1}{2}$ oz.
Cucumber (raw)	 5 oz.	Cheese	$3\frac{1}{4}$ oz. and fat $1\frac{1}{2}$ oz.
Celery (raw)	 5 oz.	White fish	$1\frac{1}{2}$ oz. and fat $3\frac{1}{2}$ oz.
*Apple or pear (raw)	 $1\frac{1}{2}$ oz.	Sardines	1 oz. and fat $1\frac{1}{4}$ oz.
Orange or strawberries	 2 oz.	Salmon	1 oz. and fat $2\frac{1}{2}$ oz.
Rhubarb (stewed)	 6 oz.	Crab or lobster	$1\frac{1}{2}$ oz. and fat $3\frac{1}{2}$ oz.
Apples or pears (stewed)	 $2\frac{1}{2}$ oz.	Pheasant, grouse, or partridge	$3\frac{1}{4}$ oz. and fat $1\frac{1}{2}$ oz.

Fats are meat fats, suet, dripping, butter, margarine, olive oil; thick cream (twice the amount).

* These articles to be taken only if specially allowed by the physician.

Doctor's Prescription.

Rations per day—
 Breakfast:
 Dinner:
 Tea:
 Supper:
 Date:

The scheme is elastic and permits of easy modification to meet all requirements. In acidosis all or some of the fats can be omitted for a time. If the carbohydrate tolerance is high or improves, extra carbohydrate can be added as extra first half-lines. It may eventually be found that a quantitative diet has become unnecessary and qualitative restrictions alone will control the disease.

I find the scheme works admirably. From the doctor's point of view it eliminates the lengthy planning of diets; the patient has only to be weighed to calculate his initial diet and subsequent adjustments are easy. Patients themselves can grasp the scheme in two minutes, and the only tax on them is the accurate weighing, to which they gladly submit when they feel the benefit of it. Letter scales modified, and costing four to five shillings, meet the purpose in cases of forced economy; otherwise some type of confectioner's scale is preferable. I use this scheme particularly for out-patients and for those who are not very intelligent.* Really intelligent patients seem to prefer the scheme of Dr. Harrison and myself, taking a pride in the accuracy and variety of their diets.

REFERENCES.

¹ G. A. Harrison and R. D. Lawrence: *Food Tables*, 1924. ² Woodyatt: *Arch. Int. Med.*, 28, 125, 1921.

SPONTANEOUS RUPTURE OF THE HEART.

BY

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WE have read with much interest the reports of five cases of spontaneous rupture of the heart recorded in the *BRITISH MEDICAL JOURNAL* for August 30th (p. 373), September 13th (p. 465), and October 11th, 1924 (p. 669). The following is an account of the clinical history and *post-mortem* examination of a heart which had ruptured in a patient under the care of Dr. Skeen, Fife and Kinross District Asylum.

CLINICAL HISTORY.

The patient, who was the subject of old-standing dementia, died in November, 1922, at the age of 65. During February, 1917, she had cardiac attacks, and again in May, 1921. She was slow in her movements, rather decrepit, and frail-looking. She did not perform any work, but wandered about aimlessly, at a gentle pace. There was never any dyspnoea. The extremities, nose, chin, and ears were occasionally cyanosed. Prior to her death she was walking quietly on a level piece of ground, neither evincing nor experiencing excitement. She was observed to drop down, and died a few moments later.

* This scheme, amplified and with explanation for doctors and instructions for patients, can be obtained in a convenient card form from Messrs. Lewis and Co.

POST-MORTEM EXAMINATION.

The heart was small, measuring 3 in. vertically and 4 in. transversely. There was a moderate amount of epicardial fat present.

Condition of Arteries.

Aorta.—The ascending part was soft, pliable, and comparatively free of atheromatous patches, except at its lower part, where one or two were present. The cusps of the aortic valve, especially the right and posterior, were stiffened at their bases with patches of calcification.

Right Coronary Artery.—The orifice of this artery, while reduced in size, was not so small as the orifice of the left coronary. On cutting the vessel transversely a quarter of an

A drawing of the posterior surface of the heart. Before the heart was dissected the perforation appeared as a slit. It became enlarged as the result of manipulation. The right coronary artery and its two main branches are seen. They supply a larger area than usual on the posterior surface of the heart. The posterior branch of the left coronary artery is seen in the drawing.

inch from its origin, its lumen was found to be reduced to a mere slit by the presence in its wall of annular atheromatous thickening. The main stem of the right coronary artery was tortuous and presented patches of calcification along its whole course. Its two branches were also markedly atheromatous. It did not give off a right marginal branch, but divided into (a) an inferior interventricular branch, (b) a terminal branch which passed down on the posterior surface of the left ventricle; this branch was in close proximity to the branch of the left coronary (see drawing). On cutting across the inferior interventricular branch near

its termination it was found that its lumen would scarcely admit a pin. The other branch was similarly reduced in calibre.

Left Coronary Artery.—At its origin from the sinus of Valsalva its lumen was exceedingly small, but immediately distal to its origin the lumen became perfectly patulous, 6 mm. in diameter. Distally there were patches of atheroma involving rather more than half the circumference of the vessel wall, but the lumen was not greatly reduced. Its anterior branch had numerous patches of atheroma, with the result that at many points its lumen was almost obliterated. Its posterior branch, somewhat smaller than usual, pursued a normal course, but it was also markedly atheromatous, and its lumen extremely narrowed.

Auricular Part of the Heart.—Both auricles were normal in appearance. The muscle coats were rather pale, and the walls exceedingly thin.

Ventricular Part of the Heart.—The tricuspid valve was normal. The bases of the cusps of the mitral valve were slightly calcified. There was no narrowing of the tricuspid or mitral orifices.

Left Ventricle.—For the greater part the muscle wall was thinner than usual. It was six-eighths of an inch at its thickest part and was five-eighths of an inch in the region of the site of the perforation. On the posterior wall about 1½ in. from its apex, and between the two branches of the right coronary artery (see drawing), there was a perforation 1 cm. in length. It passed through the entire thickness of the wall of the ventricle. On examining the interior of the chamber after reflection of the posterior cusp of the mitral valve, it was found that the heart muscle around the region of the perforation was somewhat necrotic in appearance, and the fibres of the heart in this area had ceased to manifest their normal colour and appearance. On microscopic examination of a piece of tissue taken from the posterior wall of the left ventricle adjacent to the site of the rupture the following appearances were found: The muscle fibres were not closely packed together; they had lost their striation and some had no nuclei. Fibrous tissue cells were abundant with large nuclei; they appeared to replace the muscle cells to a large extent.

REMARKS.

The salient features observed *post mortem* were:

1. Narrowing of the lumen of the right coronary artery, causing almost complete obstruction of the circulation through that channel.

2. Secondary fibrotic and degenerative changes in the cardiac muscle in part of the region supplied by the right coronary artery.

3. The rupture was situated in this region.

4. Degenerative changes were more prone to occur in the specimen described, as the area affected was entirely dependent for its blood supply on the right coronary artery.

It would be of interest to know if the coronary vessels were affected with arterio-sclerosis in the five cases recently reported. In four of them reference was made to degenerative changes in the aorta. Were the orifices of the coronary vessels narrowed in these cases? In some instances they may be quite patulous, while the lumen of the main stems is narrowed as the vessels run in the substance of the heart muscle. In one of the cases reported the aorta showed no sign of disease. It did not follow that the coronary vessels were in a similar condition. The weight of the heart in these cases was worthy of note. In each of the five reported it was found "enlarged." In the case which we have described it was smaller and under average in weight.

Various suggestions have been advanced to account for spontaneous rupture of the heart. It is, without doubt, the result of a diminished blood supply with consequent secondary degenerative changes in the heart muscle, caused by arterio-sclerosis in one or both of the coronary arteries.

A SIMPLE METHOD OF BLOOD TRANSFUSION IN INFANCY.

BY

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THE value of blood transfusion in severe degrees of shock is now generally admitted. I recently had occasion to apply it in a male infant 4 months old, in an extremely collapsed state, when lesser methods of treatment had failed.

After three weeks' enteritis, with associated pyelitis due to *B. coli*, the child lay with drooping eyelids, half-closed sunken eyes, waxen face, depressed fontanelle, utterly listless, and apparently moribund. Half a pint of subcutaneous saline given earlier in the day had failed to produce any improvement. Death within the hour was expected by all in attendance. It was decided to attempt blood transfusion, and the method employed seems worth recording in detail, as it proved effective, and gives promise of help in certain wellnigh hopeless cases. The operation was carried out in an operating theatre, but could be performed with little more difficulty in a private house.

A bowl of normal saline, so that the syringe and needle might be washed if necessary, a solution of sodium citrate (6 grains to 1 c.cm. distilled water), and a solution of 1 per cent. novocain with adrenaline, were prepared. Two 10 c.cm. syringes (one as a reserve) with two fine needles, sterilized by boiling, were available. The needles were of medium length, not so fine as hypodermic needles, but finer than the usual exploring needle.

The mother sat with her arm resting on a table in convenient proximity to the child. Venous congestion was produced in the mother's arm with a turn of the bandage applied to the upper arm in the usual manner. She was warned to ignore any loss of blood as quite insignificant and unimportant to herself. Her median basilic vein was then exposed under local anaesthesia with 1 per cent. novocain. A ligature was passed beneath the vein, but left untied and gripped with a Spencer Wells forceps for lifting and steadying.

Under novocain anaesthesia an incision was made across the upper part of the child's thigh, about an inch below and parallel to Poupart's ligament. The subsequent steps of the operation are made easier if this incision is long rather than short. The subcutaneous fat was divided, and the vein which lies in the deeper part of the fascia, well to the inner side of the femoral artery, was found. It is important not to prick the vein, and the deeper part of the incision in the fascia was made in the direction of the long axis of the vein, after retraction of the margin of the wound. An aneurysm needle was then passed under the vein, and moved up and down, thus clearing 1 to 1½ inches; the handle of the aneurysm needle falling at the peripheral end of the wound cocked the vein up, putting it on the stretch and steadying it.

Into the syringe and needle 1½ c.cm. of the citrate solution was introduced, and it was then filled with blood from the mother's vein. No attempt was made to stop the bleeding from the mother's vein at the moment, but the syringe was quickly shaken to mix the blood and citrate solutions, and such air bubbles as were present were expelled. The child's vein was now lifted and stretched with the aneurysm needle in position and the needle of the syringe introduced into the vein with its point lying superficially and its bevelled surface deeper; in this manner the point is more easily seen and controlled and less easily driven through the vein wall. With the needle pushed well along the vein the 10 c.cm. of blood were easily and rapidly introduced and the vein tied to prevent any possible haemorrhage; the wound was closed and dressed with gauze and collodion to prevent any unnecessary exposure of the child. There was no shock to the child, who scarcely moved throughout the operation.