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Personal Paper

Diet and dialysis

PEDER K K KNUDSEN

Abstract

Personal experience shows that subjective and objective improvements can be achieved in chronic renal failure treated with dialysis. These aims were achieved by limiting energy intake to 8 MJ a day and by substituting cassava for bread and potatoes, thereby reducing the intake of protein, sodium, potassium, and phosphorus. Water soluble vitamins were added to the diet. With this regimen blood urea concentrations vary between 2.5 and 12 mmol/l for most of the week and the packed cell volume between 0.30 and 0.37.

Introduction

It is difficult to reach scientifically valid or proved guidelines for treating patients with chronic renal failure, given their varied diets and lifestyles. I have been on haemodialysis for nine years and have visited several renal units other than my main unit. Generally I have failed to find any consensus on treatment with haemodialysis combined with diet. I have also found some resignation to a once fatal condition and a lack of commitment to make the best of things. Patients do not know enough about their disease and are not motivated to keep to a suitable diet. But, in my view, this is an absolute must: my well being did not start to improve until I took an active hand in my own treatment.

The following is based on the experience of a patient who is also a surgeon with nine years of dialysis and nine years of trial and error behind him. A 62 year old man, I have cysts in my remaining kidney. Over the period of observation (1981-6) my weight has fallen from 65.5 kg to 61 kg, remaining at 61 kg for three to four years; over this time both muscle volume and strength have increased, but urinary output has fallen from 50 ml/day to about 5 ml/day. Creatinine clearance is zero.

My own experience shows that patients with chronic renal failure do not have to feel ill. It is possible with diet and dialysis alone to

bring the blood concentrations of urea, potassium, and phosphorus back to normal. As a result and without added erythropoietin the packed cell volume will rise to 0.30 or above. It is an admission of failure if a patient has to resort to blood transfusions and aluminium hydroxide.

Seeing the light

I passed my watershed on 8 June 1983. Until then I had undergone dialysis for five hours three times a week. Without enough understanding of the importance of diet at that time I became anaemic and had to have transfusions of two units of blood every month. I had several bouts of uraemic pericarditis and pleurisy and was admitted to hospital three times with endocarditis. In those days my blood urea concentration was about 30 mmol/l. I accepted my condition as inevitable, thinking that this was what it was like to have chronic renal failure. During the winter of 1982-3 I made some observations that proved that I could provoke haemopoiesis if I could improve the dialysis. I took up the challenge.

On 8 June 1983 I increased the speed of the blood pump from 200 ml/min to 350 ml/min, to get maximal clearance. I extended the dialysis time from five hours to five and a half hours. I exchanged my DAK 90 dialyser for a DAK 135. Finally, I tightened my diet still further. My blood urea concentration fell below 20 mmol/l for the first time, and after some months my packed cell volume slowly rose to a plateau of 0.30. Then I imported some cassava from England to replace the potatoes and most of the bread in my diet, and the packed cell volume rose to 0.37 (see graph).

The diet

The main problem for patients with renal disease is to get enough energy and essential amino acids without too much protein, potassium, and phosphorus. I try to limit my intake to fewer than 8.36 MJ (2000 kcal)/day and my protein intake to less than 40 g/day. These are distributed between two meals, morning and evening (more meals than this entails difficulties in limiting the total intake).

I decided that cereals and potatoes were of no use as my main staple. If they are relied on as the main source of energy both bread and potatoes provide too much protein, and potatoes also provide too much potassium. I rejected them in favour of cassava (*Manihot*

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esculenta). Prepared in the way I do it, cassava has, per 100 g, 0.94 MJ (225 kcal), 1 g protein, and 10 g vegetable oil. My assumption that it has insignificant amounts of sodium, potassium, and phosphorus is based on the fact that my serum potassium concentration has become normal and that I now have to add salt to my food to keep my blood pressure at 120/70 mm Hg.

Blood urea concentration and packed cell volume 1981-6. All tests were performed after the longest period off dialysis (three days), and average values are given if several values were obtained in a month. Blood transfusions (▲) were given when packed cell volume fell to 0.24.

Cassava, now my staple food, provides a little less than half my energy intake per day for a price of 3.5 g protein. The remaining 30 g of protein and the allowed amounts of potassium and phosphorus can readily be obtained from meat and other fresh foods. Thus I have been able to lower my total protein intake to below 40 g/day and to get most of this from meat and eggs—important to ensure an adequate supply of essential amino acids. The lower a person's protein intake, the lower the blood urea concentration—though there is a limit, probably around 0.5 g protein/day/kg body weight. To minimise the loss of essential amino acids during dialysis it is important to take the daily ration of meats and eggs after dialysis and not before.

Water soluble vitamins are lost during dialysis. Given this and

the overall lower intake of food it is advisable to add vitamins to the diet. Every day I take vitamin B₁ 30 mg, vitamin B₂ 30 mg, vitamin B₆ 30 mg, nicotinamide 120 mg, pantothenic acid 54 mg, oral vitamin B₁₂ 1 mg, folic acid 5 mg, and ascorbic acid 100 mg. I also take 10 g of cod liver oil on the assumption that some energy, vitamins, and unsaturated fishy fatty acids from the ocean are good for me.

The dangers of sodium and potassium imbalance are well known and, of course, serum phosphorus concentrations have a bearing on calcium metabolism. Nevertheless, with careful selection of food and dialysis three times a week serum phosphorus concentrations can be kept within normal limits. Items such as cheese, ham, kidney, heart, liver, oats, and spaghetti must go by the board. (Regrettably, however, most renal units still serve patients with cheese and ham.)

Dialysis

On such a diet and performing dialysis three times a week patients should be able to keep their blood urea concentrations between 2.5 mmol/l and 12 mmol/l for five and a half days and between 12 mmol/l and 16 mmol/l for the remaining one and a half days. If dialysis was performed over four days a week the concentration could be maintained constant between 2.5 mmol/l and 12 mmol/l. Then the packed cell volume would rise well into the 0.30s. A blood urea concentration of 30 mmol/l is neither necessary nor acceptable.

Conclusions

Of my 13 years of illness, nine have been spent on dialysis. But I have never regretted giving up the idea that my treatment was a matter entirely for the nephrologist. Through trial and error I have greatly improved my health and well being. Only a few dietary transgressions are needed to reverse the improvement, but adherence to a strict diet will make things right again. There is no need for complacency because very few patients are as well as they should and could be. A patient with chronic renal failure can feel as well as anybody.

I thank the renal unit of the University Hospital, Aarhus, for their help in preparing the illustration.

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MATERIA NON MEDICA

Rule of three

Modern man's brain is said to function at three levels: the highly developed cerebral cortex, the limbic system controlling autonomic functions, and the primitive reptilian brain. Thoughts relating to these matters occurred to me when, on a recent visit to Japan, I purchased tickets for the Shinkansen Superexpress—popularly known as the bullet train.

The ticket seller at Tokyo station, a middle aged man with greying hair, was seated at a console representing the very best in computer technology as it relates to the reservation of seats and the printing of tickets. I gazed, mesmerised, at the green monitor screen on which was dancing, at the operator's bidding, a myriad of Japanese language characters. British Rail, I recalled, never had anything quite like this when I used to buy my tickets at King's Cross or Euston Stations.

The input I provided was simple enough: two reserved seats for the 10 o'clock express from Tokyo to Kyoto, leaving the following morning. In an instant two glossy and elegantly printed tickets, the size of air line tickets, were delivered by the softly purring machinery and handed to me.

So far so good; all that was now required was to pay the several thousand yen owing for the proposed 2½ hour journey. At this point the ticket

salesman turned from the gleaming console and focused his attention on the time worn abacus lying on the desk in front of him. With a rapid sliding to and fro of the counters across the metal rods of the abacus the accounting was soon done.

I handed over a wad of notes and waited for my change. After he had leafed through the banknotes one further step needed to be done; raising his left hand the man placed his thumb first on the little, then the middle, and finally the index finger and handed me my change. The transaction was complete.

In one brief minute the booking, purchasing, and paying for the rail tickets for my wife and me had required the use of state of the art computerised technology, the traditional Chinese abacus, and, as a final step, a rapid calculation using man's oldest accounting device, his thumb and fingers.

The Japanese are a highly organised people, and it was a pleasure to spend several days in their beautiful country. It goes without saying that the journey by rail on the Shinkansen Superexpress from Japan's largest and most modern city to Kyoto, venerable city of a thousand temples and shrines, went without a hitch.—A GEOFFREY DAWRANT, physician, Edmonton, Alberta.