Clinical use of digoxin-specific IgG and Fab fragments comprised intravenously in the management of digoxin intoxication with Fab fragments of digoxin-specific antibodies. 


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Short-term control of brittle diabetes using a Biostator

The Biostator (Miles Laboratories Ltd) is a machine which continuously samples venous blood, measures the blood glucose concentration and then infuses either insulin or glucose intravenously. The rate of infusion is determined by an algorithm stored in the machine's computer. We report the first use of this machine to control brittle diabetes (as defined by Pickup et al) in the medical ward of a district general hospital.

Case report

A 13-year-old girl (weight 55 kg) usually achieved satisfactory control using subcutaneous Actrapid insulin delivered by a Mill Hill infusion (average daily dose 60 units). Three or four times each year she used to become resistant to doses of more than 500 units of subcutaneous and intramuscular insulin and rapidly became ketoadicotic. Control was usually re-established without difficulty using intravenous insulin (60-120 units daily), which was continued for 1-2 weeks until the resistance to subcutaneous insulin settled spontaneously.

On 27 December 1981 she was admitted to hospital because of resistance to subcutaneous insulin, and for the first time it was impossible to achieve stable control with intravenous insulin although blood samples were taken every 1-2 hours by day and at night. Blood glucose concentrations were measured using BM-Test-Glycemic 20-800 strips (Boehringer-Mannheim Corporation) and fluctuated rapidly between 1 and 44 mmol/l (18 and 792 mg/100 ml). Between 26 and 30 January 1982 her diabetes was controlled using a Biostator. The constants used to determine the infusion rates of insulin or glucose were those preprogrammed into the computer, except that the variance, which determines the response rate to a change in blood glucose concentration, was increased from 100% to 200%, during the first 24 hours. Blood glucose concentrations during the second and third days of this treatment are shown in the figure. Lack of suitable veins for the sampling cannula, which had to be replaced three times, resulted in the treatment being stopped after four days, during which time the blood glucose concentrations during the second and third days' treatment with the Biostator. The record begins after a two-hour interruption due to a blocked cannula. Arrows marked S indicate gaps for standardisation; unmarked gaps are due to cannula blockages.

Blood glucose concentration (mmol/l):

Mid-arm circumference as simple means of identifying malnutrition in Crohn's disease

Malnutrition is common in patients with Crohn's disease. Weight loss is widely used as a simple means of identifying patients at risk of malnutrition, but it may be an unreliable indicator if it depends on the patient's memory and if oedema occurs as a result of hypalbuminaemia. Moreover, the importance of weight loss may be considerably greater in thin subjects than in obese ones. Measurement of mid-arm circumference has been used as a simple method of objectively assessing nutritional state among children. We performed a study to determine whether this measurement was of value in predicting which adult patients with Crohn's disease were at risk of malnutrition.

Comment

We have shown that the Biostator can be used on a general medical ward to control brittle diabetes in the short term. Major advantages for the patient were the abolition of hypoglycaemia and the freedom from fingerprick blood samples, which allowed regular sleep. The absence of hypoglycaemia may have contributed to the improved diabetic stability when conventional insulin infusions were restored. This improvement was only temporary and by May 1982 there had been three further episodes of insulin resistance.

It was not possible to compare insulin dosages delivered by the Biostator with those by conventional means because of an intermittent leak on the poorly designed connector joining the infusion tubing to the infusion cannula and because we took no precautions to prevent adsorption of insulin to plastic. The glucose analyser and computer functioned perfectly but the double lumen sampling cannula was not satisfactory. It is 5.5 cm long and can therefore only be used in peripheral veins, which are often scarce in patients who have had repeated episodes of ketoacidosis. The inner lumen is only 0.51 mm in diameter so the limb must be firmly splinted if the cannula is near a joint. A longer cannula which could be placed in a central vein is needed and would have the added advantage of allowing the patient greater mobility.

We estimate that a biochemistry technician is needed for at least 20 hours each week to run the machine. Extra work for medical staff was caused mainly by the flushing or replacing of blocked cannulas and was very time consuming in this case. The nursing staff standardised the analyser every four hours and soon became familiar with the machine. The extra nursing time involved was probably no greater than the time previously spent on taking fingerprick blood samples and treating hypoglycaemia. Brittle diabetes is a rare and dangerous illness. Its treatment with the Biostator in a district general hospital stretches resources to the limit, and we could not have sustained the necessary effort for more than a week.

1 Clemens AH, Chang PH, Myers RW. The development of Biostator, a glucose controlled insulin infusion system (GCIS). Horm Metab Res 1977;suppl 7:23-33.

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Patients, methods, and results

We studied 106 outpatients with Crohn's disease (age range 18-72 mean 41 years); diagnoses were based on conventional criteria. Height, weight, mid-arm circumference (MAC), and triceps skinfold thickness (TST) were measured in the standard way. Mid-arm muscle circumference (MACM) was calculated from the formula MACM = MAC - 0.314 TST. Results were expressed as a percentage of ideal standards.

There was a strong positive correlation between weight and mid-arm circumference, both expressed as a percentage of the ideal standard (r = 0-92, p < 0-001, n = 106). Forty-eight patients were taking prednisolone, with 40 receiving long-term treatment with a mean daily dose of 8 mg. The correlation coefficient in this group between weight and mid-arm circumference was also strongly positive (r = 0-899, p < 0-001, n = 48). Mid-arm circumference at the 90% standard (26-4 cm in men, 25-7 cm in women) appeared useful as a reference point as all 39 patients whose mid-arm circumference was below 90% of the ideal were below normal weight, including 21 patients who were more than 10% below ideal weight.

Seventy patients with Crohn's disease were then arbitrarily divided into those undernourished with mid-arm circumference less than 90% ideal and those well nourished with mid-arm circumference greater than 90% ideal. Weight, mid-arm muscle circumference, and laboratory variables were compared between these two groups and also with results obtained from patients with ulcerative colitis and healthy subjects. Serum albumin concentration (normal range 35-50 g/l) was measured by SBA plus autoanalyser, serum prealbumin concentration (normal range 200-500 mg/l) by radial immunodiffusion, and haemoglobin concentration by Coulter counter. Creatinine height index (normal range 1-0-01) was based on mean daily urine creatinine excretion estimated from two consecutive 24-hour urine collections. This index gave a measure of lean body mass.

For each variable studied the groups were well matched in terms of numbers, age, and sex. The site of the Crohn's disease was classified as diffuse small bowel, ileocolal, ilioileocolic, or anorectal. There were more patients with diffuse small-bowel disease and fewer with colonic and anorectal disease in the undernourished group with Crohn's disease compared with the well-nourished group (p < 0-05). Sixty per cent of undernourished patients with Crohn's disease were taking steroids compared with 43% of well-nourished patients; this difference was not significant.

The table shows the results. For every variable patients with Crohn's disease with mid-arm circumference less than 90% ideal had values significantly below those in patients with mid-arm circumference greater than 90% ideal, who in turn were different from the control groups. Creatinine height index (mean ± 1 SD) in 20 patients with Crohn's disease with mid-arm circumference less than 90% ideal (0-71 ± 0-17) was also significantly lower than that in 18 patients with mid-arm circumference greater than 90% ideal (0-89 ± 0-18) and in 22 healthy individuals (1-01 ± 0-21) p < 0-01.

Anthropometric and laboratory measurements in patients with Crohn's disease and ulcerative colitis and normal subjects. Values are means ± 1 SD

<table>
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<tr>
<th>Patient Group</th>
<th>Mid-arm circumference</th>
<th>Serum albumin</th>
<th>Serum prealbumin</th>
<th>Haemoglobin</th>
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<td>Patients with Crohn's disease</td>
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<td></td>
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<tr>
<td>Mid-arm circumference &lt; 90% ideal</td>
<td>86-7 ± 7-1*</td>
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<td>117-3 ± 17-1</td>
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<td>Mid-arm circumference &gt; 90% ideal</td>
<td>82-3 ± 7-0*</td>
<td>102-0 ± 9-8</td>
<td>102-10 ± 4</td>
<td>97-2 ± 9-0</td>
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<td>Patients with ulcerative colitis</td>
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<td>36-6 ± 5-7</td>
<td>43-2 ± 5-7</td>
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<td>Mid-arm circumference &gt; 90% ideal</td>
<td>215 ± 76*</td>
<td>290 ± 62</td>
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<td>13-7 ± 13</td>
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*Comparison with three other groups: p < 0-001 (Student's t test).

Comment

Patients with Crohn's disease with a mid-arm circumference less than 90% of the ideal standard had appreciably reduced laboratory and anthropometric variables compared with well-nourished patients with mid-arm circumference greater than 90% of the ideal standard. The impaired nutrition probably reflects more extensive small-bowel disease. Well-nourished patients with Crohn's disease were in turn similar to the two control groups. There was no significant difference in steroid treatment between the two groups with Crohn's disease, so that any steroid effect would not invalidate the result.