distended rectum was emptied manually. The limbs and jaw were hypotonic with absent jerks and normal sensation. The CSF protein was normal, and the serum potassium 1.8 mmol/l. Although 100 mmol intravenous and intra-gastric potassium was administered daily, it took 48 hours to raise the serum potassium to 2.5 mmol/l. He could breathe unaided after 36 hours. Recovery was uneventful.

Discussion

Carbenoxolone is widely used, and, although some reported side effects are neuromuscular,¹⁻³ such a profound Guillain-Barré-like weakness is unusual. Our second patient even had a raised CSF protein. The side effects of carbenoxolone treatment seem to be related to the electrolyte disturbance.³ Sodium and fluid retention with potassium loss occur in 60% of patients receiving a daily dose of 300 mg.⁴ Our three patients were not receiving diuretic or other treatment and did not have hepatic cirrhosis or primary aldosteronism. They rapidly responded to potassium replacement and remained well at follow-up when not receiving supplements.

It is clearly important to consider the possibility of carbenoxolone treatment and to check the serum potassium concentration in a patient with weakness, myopathy, or paraesthesiae.¹⁻⁵ Our experience shows that the weakness may simulate a life-threatening Guillain-Barré syndrome; a wrong diagnosis may result in hypokalaemia worsened by steroid treatment.

We thank Dr A B Herring for help with the first case, and Dr B A Gwynne-Jenkins for details of the second. Mrs F Oates prepared the script.

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Glucagon and beta-blocker toxicity

This report illustrates the effectiveness of glucagon in a case of oxprenolol overdosage.

Case report

In June 1975 a 62-year-old man was admitted to the casualty department having collapsed. He was given external cardiac massage by the ambulance crew and on arrival was pulseless with cold, blue peripheries. The pupils were 4 mm in diameter and unreactive to light, and the ECG showed asystole. After 35 minutes of resuscitative measures, including intravenous isoprenaline infusion, a 3-ml bolus of intravenous adrenaline (1/1000 strength), 20 ml calcium gluconate, and 100 ml sodium bicarbonate, a slow sinus rhythm of 32 beats/min was established. This increased to 68 beats/min after 0.6 mg intravenous atropine. Respiration also returned and the pupils contracted to 3 mm in diameter and responded to light. Systolic blood pressure did not increase above 30 mm Hg, and further adrenaline by continuous infusion had no effect on heart rate or blood pressure over one and a quarter hours. Glucagon 10 mg intravenously produced an increase in blood pressure to 150 mm Hg within 60 seconds, and shortly afterwards an improvement in peripheral circulation occurred. As the cardiovascular state improved severe bronchospasm developed, which was treated successfully with intravenous terbutaline. Urinary output increased from 30 to 150 ml/hour, and central venous pressure fell from 15 to 3 cm of water. A continuous infusion of glucagon 2 mg hourly was given over the next five hours, and improvement continued after its withdrawal. The patient was eventually discharged after an uncomplicated recovery.

The response to glucagon suggested the possibility of beta-blocker toxicity. It was subsequently found that the patient had ingested large amounts of

oxprenolol and diazepam. The serum oxprenolol level was 11.7 µmol/l (3100 ng/ml). The manufacturers state that a range of 1.3-1.9 µmol/l (350-500 ng/ml) would be expected one hour after an oral dose of 80 mg.

Comment

The positive inotropic effects of glucagon were first described in 1960,¹ and since then much interest has been taken in the use of glucagon in heart failure. Its inotropic effects have been noted in man,² and are more evident in acute failure than in chronic heart failure.³ They were investigated in isolated cat atria and intact dog hearts by Glick *et al*,⁴ who showed their persistence after beta-blockade with propranolol. Similarly, in man glucagon has been reported as effective in increasing cardiac output when the myocardium is severely depressed by beta-blockade.² We know of only one previously reported case in which glucagon was used effectively to treat myocardial depression after self-poisoning with beta-blocking agents.⁵ Our patient showed the effect of glucagon in the presence of overwhelming beta-blockade unresponsive to intravenous catecholamines.

We thank Dr R N Maini for permission to report this case.

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Development of RhD antibodies after kidney transplantation

We wish to report a case in which RhD antibodies developed apparently as a result of sensitisation to a kidney graft.

Case report

An A, RhD-(cdē/cdē) man entered the London Hospital dialysis and transplantation programme early in 1975 as a consequence of analgesic nephropathy. RhD antibodies were detected for the first time at a level of 0.1 mg anti-D/l during a routine screening for atypical antibodies before a second kidney transplant. The table shows the relevant blood transfusion and clinical history. All serum samples indicated were screened by the conventional techniques for detecting blood group antibodies: (a) saline agglutination test at 17°C; (b) agglutination of papain-modified cells at 37°C; and (c) indirect antiglobulin test at 37°C. The RhD-cdē/cdē state of each donor of the 19 units of transfused blood was rechecked at the regional transfusion centre on several occasions.

Blood transfusion and clinical history

Date	Events	Serum samples tested for:	
		Anti-RhD	Anti-HLA-A, B, C
1972	15 Units whole blood (RhD-)	-	Not tested
1973	2 Units nitrogen-frozen blood (RhD-)	-	-
1975	Haemodialysis started	-	-
3 Feb		-	-
15 Aug	Cadaver kidney from RhD + donor	-	-
2 Sept		-	-
3 Sept	Donor nephrectomy, 2 units of nitrogen-frozen blood (RhD-)	-	-
25 Nov	2nd transplant (RhD-)	+	-
1976		+	-
(25 Feb)		+	-

The first kidney donor had suffered a head injury in a road traffic accident. After donor nephrectomy the kidney was immediately perfused with Perfudex for 10-20 minutes and placed with the perfusate in a sterile bag and stored in ice until transplantation six hours later. The blood group and tissue type of the patient was A1, RhD - ; HLA-A1, 2 B5, 8, and of the donor A1, RhD - (Dr Barbara Dodd, department of forensic medicine, London Hospital Medical College); HLA-A1, 2 B5A, 8 (B5A is a local "split" of HLA-B5). Eighteen days after the transplant and one day before transplant nephrectomy no RhD antibodies were detected in the patient's serum. Two months later, before a successful second graft, RhD antibodies were first detected and have remained present to the same titre (1/4 by serum albumin and indirect antiglobulin technique) in all subsequent samples tested to date. No cytotoxic antibodies were detected after routine screening of the same samples against a reference panel representing all HLA-A, B, and C antigens.

The first grafted kidney never functioned and two weeks after transplantation a biopsy showed total infarction and the kidney was removed shortly afterwards. Histology of the kidney was therefore non-informative.

Discussion

The development of RhD antibodies is most probably a response to previous sensitisation by the first transplant, as this was the only transfused or transplanted tissue from an Rh+ donor. The appearance of Rh antibodies within three months of the graft is also consistent with this explanation¹; and the absence of cytotoxic anti-HLA antibodies does not preclude the formation of red cell antibodies.² Conventional immunotherapy with azathioprine and steroids, used after both transplants, did not apparently suppress the antibody response. Probably passenger red cells, not completely washed out by perfusion, were responsible for the sensitisation rather than kidney cells per se as the Rhesus antigen has not been detected on other tissue. Gunson *et al* have pointed out that less than 0.5 ml of D-positive red cells is sufficient for sensitisation.³

As the particular kidney graft was considered a primary non-functional graft it was not possible to establish whether the Rh antibodies contributed to its failure. It would be of interest to know if there are any other similar cases of Rh antibody production and the fate of such transplanted organs.

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Electronic monitoring of urinary incontinence in the elderly

Training and retraining for sanitary competence is common practice in childhood and in the elderly. In both cases the procedure is based on the Pavlovian conditioned reflex principle. In childhood the endeavour is to imprint the habit *de novo*; in the elderly all that can be achieved is a revival of the life-long habit that has fallen into disarray.

Toilet training in the elderly is a common nursing technique. It is often started before diagnosis is made, but usually it is based on a charted record of bowel and bladder evacuations.

Clearly, to achieve success most easily the principles that have been investigated in detail by Pavlov¹ and others must be followed. This means providing a conditioning stimulus (sitting on a bedpan, commode, etc) when the bladder or rectum is full enough to provide sensory stimulation—before, and not after, evacuation.

Often the last thing to be corrected in the elderly is the episode of true nocturnal incontinence unassociated with delay in providing

facility, high beds, etc. The observation of wetness by the nursing staff must be accurate to be of any use and be recorded. Nowadays, nurses are scarce at night and accurate charting is difficult to achieve. Under these circumstances some sort of monitoring technique is required.

Method

The basic requirements are: accuracy of method and no disturbance of the patient by noise or wetting. The time recorded when the patient is asleep will represent the longest period before bladder evacuation, since emotional and sensory stimuli are removed.

A technique that provides these conditions using an Acrylan pad in combination with an under pad and an electrode was described by Willington.² To achieve accurate timing independent of nursing availability an electronic device was produced by Ball and McFadden.³ The important points of this are that the current flows to only about 10 m/s and is of very small amplitude (about 5 μ V) (see figure). When a series of events has been timed the nursing staff can determine with some accuracy the time they must wake the patient to use the commode. Events can then take place in the correct order: (a) full bladder; (b) vesical sensation; (c) sit on commode; (d) evacuation.

General lay out of apparatus. Corner of Acrylan pad has been turned back to show polyethylene and electrode.
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Discussion

The normal conditioning stimulus used for this purpose is the sensation of fullness of bladder or rectum. Simultaneous presentation of the accustomed means and conditions produces a successful result—that is, bladder evacuation (reinforcement). Skill is required by child or adult to void without a sensation of fullness. This is the social requirement demanded from young and old alike; it is the result of prolonged practice by the child and accepted without insight by most adults.

In the treatment of childhood enuresis buzzer alarms are popular and successful. There has been much discussion, but Woodmansey⁴ believes it to be a traumatic experience that the child must overcome. The procedure described here would enable training to occur without psychological trauma or skin hazard and shorten the training time because events may take place in the correct order. It can also be used to record the effects of drug treatment on nocturnal incontinence.

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