precipitated by leaving a protective home environment for university, where she faced major interpersonal difficulties as a consequence of her low self-esteem and appearance.

Should the association between anorexia nervosa and Turner's syndrome occur with greater than chance frequency, the latter may not be the only condition which shows this association. Anorexia nervosa may well be a manifestation of a wide range of both psychological and organic disturbances,[5] and not a unitary syndrome with a common cause. Epidemiological studies of the association with other disorders seems desirable.

[1] Pitts, E N, and Guze, S B, *American Journal of Psychiatry*, 1963, **119,** 1100.
[2] Kron, J L, *et al*, *Archives of General Psychiatry*, 1977, **34,** 332.
[3] Feighner, J P, *et al*, *Archives of General Psychiatry*, 1972, **26,** 57.
[4] Crisp, A H, *Proceedings of the Royal Society of Medicine*, 1977, **70,** 464.
[5] *British Medical Journal*, 1978, **1,** 5.

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Sexual intercourse and angina pectoris

With the incidence of ischaemic heart disease rising in the younger population the number of patients with this condition and sexual problems may be expected to increase. Hence doctors should be familiar with the physiological responses to sexual intercourse so that they can counsel patients accurately.

Patients, management, and outcome

A total of 35 patients aged 36-70 with angina were examined at monthly intervals. Each completed a questionnaire on his family life, including sexual activity. This showed that 29 had intercourse more than once a week, 19 developing angina on most occasions. Four had palpitations during intercourse, and six abstained.

Patients received basic advice on preparing themselves and their environment for intercourse. They were advised to warm the bedroom and sheets, to avoid intercourse soon after a meal or bath, and specific questions relating to each individual were then answered. Fourteen patients underwent 24-hour electrocardiographic recordings and indicated in diaries the time and duration of any activity, including intercourse. The recordings were analysed for heart rate and arrhythmias. All patients received beta-blockers and those who had had 24-hour recordings had repeat recordings. If pain occurred in spite of basic advice and beta-blockers patients were advised to take isosorbide dinitrate sublingually 10 minutes before intercourse.

The patients with symptoms became pain free during intercourse, though six required nitrates in addition to beta-blockade. Four of the six who had abstained resumed sexual activity. Two patients with palpitation developed supraventricular tachycardia and two sinus tachycardia. Beta-blockers abolished the supraventricular tachycardia and complaints of palpitation. The table shows that the sinus rate during intercourse was no more than that during normal daily activity and was appreciably reduced by beta-blockade.

Discussion

During sexual intercourse the heart rate, blood pressure, and respiratory rate rise.[1] An excessive increase in heart rate and blood pressure in a patient with coronary artery disease might induce angina, infarction, or dysrhythmia as myocardial oxygen demand exceeds supply. Hellerstein and Friedman[2] showed that the average maximal heart rate in middle-aged married couples during intercourse was 117 beats/min, compared with 120 beats/min during other activity. This similar heart rate response has been confirmed in this study. As the blood pressure rises only moderately when intercourse takes place in the security of the home environment,[3] there is little evidence to suggest that the stress to the myocardium during intercourse is any greater than that during normal daily activity. In spite of this, in a study of 100 patients after infarction, though 90 returned to work, only 40 resumed normal sexual activity.[4] Sexual activity does not appear to be related to an increased mortality rate in patients with heart disease who enjoy intercourse with their spouses in their own home. The person most at risk is usually middle-aged, having extramarital relations.[5]

24-Hour maximal heart rates (mean ± SEM)

	Before beta-blockade	After beta-blockade	P
24-Hour maximal sinus rate excluding sexual intercourse ..	124·0 ± 7·2	82·1 ± 6·0	<0·001
Maximal heart rate during intercourse	122·2 ± 7·1	82·0 ± 2·8	<0·001

Ignorance of the effects of intercourse on the heart and fear of death are overcome by time and informed comment. In this series of 35 patients only two were not enjoying angina-free intercourse after specific simple management. They mostly benefited by having the subject raised, discussion, and reassurance. In two patients 24-hour electrocardiographic tape recordings disclosed a dysrhythmia which responded to treatment enabling normal sexual activity to be maintained. Furthermore, the tape recordings after beta-blockade showed an appreciable reduction in sinus rate during intercourse. By preventing the rise in heart rate, and probably that in blood pressure, the incidence of angina during intercourse decreased. While sublingual nitrates effectively relieve angina their use removes the spontaneity of intercourse allowed by beta-blockade.

It should be routine policy to advise patients and their spouses on sexual activity, whether they have had an infarction or are regularly attending with angina pectoris. Most patients with ischaemic heart disease can enjoy normal sexual relations without risk.

[1] Bartlett, R G, *Journal of Applied Physiology*, 1956, **15,** 469.
[2] Hellerstein, H K, and Friedman, E H, *Archives of Internal Medicine*, 1970, **125,** 987.
[3] Nemec, E D, Mansfield, L, and Kennedy, J W, *American Heart Journal*, 1976, **92,** 274.
[4] Bloch, A, Maeder, J P, and Haissly, J-C, *American Heart Journal*, 1975, **90,** 536.
[5] Ueno, M, *Japanese Journal of Legal Medicine*, 1963, **17,** 536.

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Proliferative retinopathy in a patient with diabetes mellitus and idiopathic haemochromatosis

The belief was once widely held that patients with diabetes mellitus and idiopathic haemochromatosis were not prone to develop diabetic microangiopathy.[1 2] Recently there have been reports of glomerulosclerosis with typical Kimmelstiel-Wilson nodules[3] and of diabetic retinopathy[4 5] in such patients. In two studies retinopathy was noted in roughly 30% of diabetic patients with haemochromatosis.[4 5] These reports suggest that the long survival of treated patients with haemochromatosis shows that the vascular complications are related to the duration of the diabetes in the same way as those associated with idiopathic diabetes. Nevertheless, a feature of these reports has been the mildness of the retinopathy, which was not considered to have produced visual disturbance. Proliferative retinopathy has not been reported by any of these workers. We report incapacitating proliferative retinopathy in a patient with diabetes mellitus and idiopathic haemochromatosis.

Case report

A Caucasian man was aged 26 years when diabetes was diagnosed in 1956. His father had mild diabetes but there was no family history of haemo-

chromatosis. The patient was treated initially with diet and chlorpropamide. In 1961 insulin was started, the dose gradually increasing to 130 U daily. In 1964 he complained of nausea, lethargy, and impotence. Examination showed generalised pigmentation, hepatomegaly, reduced body hair, atrophic testes, and definite lipoatrophy at injection sites. A diagnosis of haemochromatosis was confirmed by a serum iron concentration of 48 μmol/l (268 μg/100 ml) (TIBC 53·2 μmol/l; 297 μg/100 ml) and a liver biopsy specimen which showed typical features of haemochromatosis. There was no history of blood transfusion or of excessive alcohol intake.

Background diabetic retinopathy was first noted in 1964. In 1967 peripheral new vessels were seen in the left fundus, but by 1970 these had not progressed. Three years later new vessels were growing from the left optic disc and there were peripheral new vessels in the right fundus. Despite repeated light coagulation he suffered from recurrent preretinal haemorrhages, though retaining useful vision. In 1976 he developed a neuropathic ulcer on the left foot which failed to heal and required a below-knee amputation.

Results of combined pituitary function test (luteinising hormone-releasing hormone 100 μg · thyrotrophin-releasing hormone 200 μg · Actrapid insulin 0·5 U/kg body weight intravenously)

	Minutes			
	0	30	60	120
LH (U l)	1	1	2	
FSH (U l)	1	1	1	
TSH (mU l)	8	8	19	
Cortisol (nmol l)	928	—	484	668
Growth hormone (mU l)	6	3	4	2
Testosterone (nmol)	10·0			
SHBG (mol l)	3·96 × 10·8			
Prolactin (mU l)	260			
Blood sugar (mmol l)	25·0	10·5	8·0	10·0

LH = Luteinising hormone. FSH = Follicle-stimulating hormone. TSH = Thyroid-stimulating hormone. SHBG = Sex hormone binding globulin.
Conversion: SI to traditional units—Cortisol: 1 nmol l ≈ 0·04 μg 100 ml. Testosterone: 1 nmol l ≈ 0·29 ng ml. Glucose: 1 mmol l ≈ 18 mg 100 ml.

In 1975 a combined pituitary function test showed impaired function (table). Hypoglycaemia did not occur during the test, but shortly after insulin administration the blood pressure fell precipitously and he collapsed. Further blood samples for growth hormone measurement were taken on two subsequent occasions roughly 15 minutes after the onset of hypoglycaemic symptoms, the concentrations being 6 mU/l and 7 mU/l. Blood sugar concentrations were 4·0 mmol/l and 2·8 mmol/l (72 and 50 mg/100 ml) respectively. Other investigations showed a normal skull *x*-ray film, normal blood urea concentration, and incomplete left bundle-branch block on electrocardiography. His HLA type is A1,3;B7.

Comment

This is the first report of proliferative retinopathy in a patient with idiopathic haemochromatosis and diabetes mellitus. It has recently been suggested that blunted growth hormone secretion may protect the retina in patients with haemochromatosis.[5] Assessment of growth hormone secretion in our patient has been limited but the evidence suggests that secretion is impaired though not absent. In spite of this the retinopathy has progressed, as might be expected in severe diabetic angiopathy.

Since regular venesection has become an established treatment for haemochromatosis the survival of these patients has been greatly extended. Thus, from the belief that they are immune from retinopathy, we arrive at the point where long-term complications are seen to be no different from those which occur in "idiopathic" diabetes.

[1] Pirart, J, and Barbier, P, *Diabetologia*, 1971, **7**, 227.
[2] Lonergan, P, and Robbins, S L, *New England Journal of Medicine*, 1960, **260**, 367.
[3] Becker, D, and Willer, M, *New England Journal of Medicine*, 1960, **263**, 367.
[4] Griffiths, J D, *et al*, *Diabetes*, 1971, **20**, 766.
[5] Passa, P, *et al*, *Diabetes*, 1977, **26**, 113.

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High circulating concentrations of glucagon in non-anaemic uraemic patients

A refractory, normocytic, normochromic anaemia occurs almost without exception in end-stage renal disease (ESRD) and contributes greatly to the morbidity of this condition. A similar anaemia has been described in the rare glucagonoma syndrome.[1] High circulating concentrations of glucagon have been reported in ESRD,[2 3] and glucagon may have a causative role in the pathogenesis of anaemia in uraemic patients.[3] We recently investigated three patients who maintain normal or high packed cell volumes despite ESRD requiring regular dialysis treatment.

Patients, methods, and results

Case 1—A man developed chronic renal failure as a result of poststreptococcal glomerulonephritis and has been on dialysis for four years. Despite this he has a tendency towards polycythaemia, and haemoglobin and packed cell volume are maintained within normal limits only by regular monthly venesection of one unit of blood.

Case 2—A man has polycystic disease and has been treated with dialysis for four years. Haemoglobin concentration and packed cell volume were normal until a few months ago, when iron deficiency anaemia developed which responded promptly to oral iron.

Case 3—A woman has ESRD of unknown cause and has been on dialysis for 2½ years. She too has always had normal blood counts.

Fasting blood samples were obtained from these three patients, from three other ESRD patients with anaemia, and from three normal subjects. The samples were immediately put into chilled glass test tubes containing EDTA and 500 U aprotinin (Trasylol) per ml of blood collected. The tubes were kept on ice until centrifugation at 4°C as soon as possible after collection. The plasma was stored at −20 C. The samples were thawed at room temperature, mixed by inversion, and centrifuged at 4°C for 15 minutes at 2000 rpm just before assay. Plasma glucagon was measured in duplicate in two dilutions using a modification of the radioimmunoassay described by Unger *et al.*[4] Unger's 30K antiserum, specific for pancreatic glucagon, was used. The sensitivity of the assay is 10 pg/ml.

Both groups of ESRD patients had grossly raised plasma glucagon concentrations (table) compared with the normal subjects ($P<0.0125$), but there is no obvious difference between the two groups with ESRD ($P>0.05$).

Plasma glucagon and haemoglobin concentrations

	Case No	Glucagon (pg/ml)	Haemoglobin (g/dl)
		Group I	
ESRD Normal Hb	1	610	14·4
	2	800	14·5
	3	510	14·2
		Group II	
ESRD Anaemia	4	620	7·3
	5	720	6·8
	6	575	7·4
		Group III	
Normal subjects	7	170	13·8
	8	150	14·2
	9	250	14·0

Comment

The exact cause of the anaemia of renal failure is unknown. Current opinion favours a combination of erythropoietin deficiency plus the effect of unidentified uraemic toxin(s) on the bone marrow. Most nephrologists nevertheless see patients occasionally who inexplicably maintain normal haemoglobin concentrations and packed cell volumes despite renal disease of comparable severity with those who do not. Many of these patients have polycystic disease, and we suggest that sufficient islands of normal renal tissue remain scattered between the cysts to maintain adequate production of erythropoietin, as perhaps has occurred in case 2.

The similarity of anaemia of renal failure to the anaemia found in the much rarer glucagonoma syndrome and the carbohydrate intolerance common to both indicate that glucagon could be incriminated in the pathogenesis of the anaemia of uraemia.[3] Furthermore, cobaltous chloride has been claimed to be effective in the treatment of anaemia in renal failure, and this substance interferes with glucagon secretion and activity in the rat.[5] Nevertheless, the findings of equally high concentrations of circulating glucagon in our three patients with