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Acrocyanosis in anorexia nervosa

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Summary: Acrocyanosis, an uncommon disorder of the peripheral circulation, may occur in patients with anorexia nervosa. It is not known why this should be, nor whether acrocyanosis correlates with any other features of the disorder. The findings in an unselected series of 155 anorectics are reported. Acrocyanosis occurred in 32 and was more prevalent among the more severely ill. It was associated also with pallor of the face and trunk, slower pulse rates and higher fasting plasma glucose levels. Acrocyanosis could represent a more extreme form of a heat conserving mechanism not uncommon in anorectics. The possible relationship between peripheral vascular changes and plasma glucose levels requires further study.

Introduction

Acrocyanosis is a rare disorder of the peripheral circulation. It is characterized by cyanosis and coldness of the hands and feet. The cause is unknown, but the pathophysiological changes consist of constriction of the skin arterioles and venous dilatation. The onset is most commonly during adolescence and early adult life, and the ratio of female to male cases is in the order of 6:1.[1] This sex difference may be partly explained by the prevalance of acrocyanosis in patients suffering from anorexia nervosa,[2,3] a disorder which is seen predominantly in teenage girls and young women.

Why acrocyanosis should occur in anorexia nervosa is still uncertain, nor is it known whether the presence of this phenomenon correlates with any other features of this disorder. This study reports the findings in a large series of anorectics, a substantial proportion of whom had acrocyanosis.

Materials and methods

The subjects consisted of a consecutive series of 155 patients suffering from anorexia nervosa referred to a district general hospital between May 1966 and April 1986. All but four patients were female. They have been described in detail elsewhere.[4] The diagnosis had been made on the basis of a weight loss of more than 10% of the calculated optimun for age, sex and height; avoidance of carbohydrate foods; amenorrhoea of at least 3 months duration in females not taking oral contraceptives; and the absence of any other psychiatric illness or organic cause of weight loss. Their ages when first seen ranged from 13 to 67 years, the great majority being less than 25 years old. The duration of weight loss ranged from only 3 months to more than 20 years, but most had been losing weight for less than 2 years.

All patients were referred to and seen by one of us (DM). The physical findings were recorded at the time in the case notes, and these included the presence or absence of acrocyanosis, emaciation and pallor. Thirty-two anorectics (21%) were found to have acrocyanosis and most of these complained of cold extremities. The correlations between the presence of acrocyanosis and other physical signs, laboratory data and radiological findings were assessed retrospectively by reference to the case notes. The statistical significance of any difference was determined using the *t*-test and, for non-parametric data, the Chi^2 test.

Results

The mean age of those with acrocyanosis (20.8 years) was comparable to that of the rest (21.1 years). Although they had been losing weight over a longer period this difference fell short of statistical significance. The mean weight of those with acrocyanosis, expressed as a percentage of the calculated optimum for age, sex and height as determined from standard tables or growth charts, was 66.7% compared to the mean weight of the other patients of 74.5% ($P < 0.001$). These differences and other clinical comparisons are set out in Tables I and II.

Emaciation was more common among the patients with acrocyanosis ($P < 0.01$), as was pallor of the face and trunk ($P < 0.01$). The mean

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Table I Clinical findings in both groups of patients on presentation

	With acrocyanosis			*Without acrocyanosis*			
	No.	*Mean*	*s.d.*	*No.*	*Mean*	*s.d.*	*P*
Age (years)	32	20.8	6.6	123	21.1	8.0	NS
Duration of weight loss (months)	32	38.8	49.7	123	24.5	37.4	NS
Weight (kg)	32	37.7	6.2	123	41.4	6.7	<0.01
Weight (% optimum)	32	66.7	10.6	117	74.5	10.0	<0.001
Systolic BP (mmHg)	32	105.2	13.3	120	104.2	12.8	NS
Resting pulse rate (beats/min)	32	62.9	11.2	117	68.8	14.2	<0.05

Table II Physical findings in 32 anorectics with acrocyanosis and 123 without

	With acrocyanosis	*Without acrocyanosis*	*P*
Loss of subcutaneous fat	32	123	NS
Lanugo hair	25	76	NS
Emaciation	19	36	<0.01
Pallor	15	25	<0.01
Orange-yellow palms	3	25	NS
Atrophic breasts	3	9	NS
Ankle oedema	3	3	NS

pulse rate was lower in the acrocyanotic cases ($P<0.05$). There was no significant difference in the systolic blood pressure, measured in the supine position. Ankle oedema was a rare finding, being found in only 3 cases with acrocyanosis and 3 without.

As regards eating behaviour, the two groups did not differ significantly with respect to the presence of bingeing, self-induced vomiting, or purgative abuse. Nor was there any difference in the prevalence of observed or reported physical overactivity.

There were no significant differences with respect to the blood picture or tests for renal and hepatic function. Similarly, the mean serum cholesterol and carotene levels did not differ between the two groups of patients. By contrast, the mean fasting serum glucose level was significantly higher in patients with acrocyanosis (4.4 ± 1.1 *vs* 3.9 ± 0.9 mmol/l) ($P<0.05$).

Chest radiographs of 35 female patients with a weight loss of at least 20% of their calculated optimum weight were compared with those of an equal group of age-matched normal females. Eleven of these patients had acrocyanosis. As reported elsewhere, the mean cardiothoracic ratio was significantly lower in the anorectics than in the control group,[4] but the mean value in the 11 cases with acrocyanosis (35.5%) did not differ significantly from that in the other 24 patients (37.4%). Computed tomography of the brain had been carried out in 23 patients. In 10 cases this had revealed widened sulci, ventricular dilatation or both these abnormalities. There was no correlation between these findings and the presence of acrocyanosis.

Discussion

The above findings confirm the clinical impression that acrocyanosis is not uncommon in patients with anorexia nervosa. It appears to be more prevalent among the more severely ill patients. Acrocyanosis also appears to be associated with facial and truncal pallor, a slower pulse rate and higher fasting plasma glucose levels.

There have been a number of recent investigations of cardiac size and efficiency in anorexia nervosa,[5] but little attention has been paid to the peripheral circulation. Where this has been studied it has been largely in the context of body temperature regulation. Wakeling and Russell[6] measured finger skin temperature as part of their investiga-

tion of thermoregulation in anorexia nervosa. Vasodilatation in response to the immersion of the contralateral arm in warm water was both delayed and abnormally slow. The explanations proposed by the authors included a protective mechanism against excessive heat loss, dehydration, emotional strain, or a primary disturbance in thermoregulation.

Gleeson and Moore[7] carried out a variety of measurements following exposure to heat. These included mean skin temperature and finger blood flow. The vasodilatation response differed between their anorectics and their healthy women, being most impaired in the two most acutely ill patients. Mecklenberg and his colleagues[8] investigated the effects of cold as well as heat and found that the body's core temperature was poorly maintained in their anorectics. Although this was not assessed directly, they concluded that failure of the peripheral vasomotor responses was in part responsible.

Luck and Wakeling[9] reported that hand blood flow was reduced in anorexia nervosa, although the mean skin temperature over a number of sites was comparable to that in healthy controls. A greater rise in core body temperature was required to initiate skin vasodilatation, but the actual temperature at which this occurred was lower. A study of rectal and skin temperature and tissue heat conductance before and after exercise has also revealed evidence of increased vasoconstriction in the limbs of anorectics.[10]

Freyschuss *et al.*[11] carried out a study of limb circulation in 16 young patients with anorexia nervosa. Calf blood flow was less than half of that in 14 healthy age-matched controls. This finding could not be attributed solely to wasted muscles. Skin temperature, measured at various points from the knees downwards, was reduced in the anorectics. The changes observed were viewed as a heat-conserving mechanism in patients with defective thermal insulation. Acrocyanosis could therefore represent a more extreme form of an energy saving mechanism common in anorexia nervosa. Its association with evidence of increased vasoconstriction in the skin of the face and trunk is consistent with this view, as is the predilection for the more severe cases.

The frequent presence of bradycardia in anorexia nervosa was first noted over a century ago by Sir William Gull.[12] Fohlin[13] has provided evidence to support the widely held view that this represents an adaptive response to the low metabolic rate seen in starvation. A common function may therefore underlie the association found between acrocyanosis and lower pulse rates, and both may involve stimulation of the autonomic nervous system in the hypothalamus.

The finding of slightly higher fasting plasma glucose levels in our patients with acrocyanosis was unexpected, and not easily explained. The possible relationship between plasma glucose levels and peripheral vascular changes requires further study.

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