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Microcirculatory assessment of vascular acrosyndrome in anorexia nervosa and analysis of manifestation factors

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Abstract

Objective: Acrocyanosis (AC) is a common manifestation of starving syndrome in anorexia nervosa. We characterized microvascular changes associated with AC and determined discriminating factors between acrally symptomatic and nonsymptomatic patients. **Methods:** We examined 34 patients with anorexia nervosa (15 restrictive–anorectic type, 19 binge-eating/purging type, duration 1–25 years). Nineteen were symptomatic (SP) and 15 were nonsymptomatic (NSP). All underwent photo-pletysmography, sonography of the brachial artery, capillary microscopy and laboratory analysis. **Results:** Disease characteristics and body mass index did not differ between SP and NSP. In SP more dilatated

efferent capillary loops and venoles were present (P < .001) and capillary flow velocities were reduced (0.21 ± 0.12 ml/min vs. 0.34 ± 0.15 ml/min; P = .015). Flow-mediated and nitroglycerininduced dilatation showed no differences. Symptomatic patients had lower leukocyte counts (P = .008), lower eosinophils (P = .003) and lower LDL (P = .045) concentrations. A logistic regression model identified only leukocytes (P = .017) and eosinophils (P = .023) to be associated with AC. **Conclusions:** In acrally symptomatic patients the typical microvascular features of AC are present. AC is associated with lower leukocyte counts and lower eosinophils. © 2004 Elsevier Inc. All rights reserved.

Keywords: Acrocyanosis; Anorexia nervosa; Eosinophils; Leukocytes; Microcirculation; Starving syndrome

Introduction

Anorexia nervosa is a serious life-threatening eating disorder characterized by a disturbance of the body scheme and self-determined restrictive dietary regimes leading to progressive weight loss with severe secondary endocrinological and metabolic consequences summarized as "starvation syndrome" [1,2]. According to Mayerhausen et al. [3] and Schulze at al. [4] who analyzed dermatologic manifestations of anorexia nervosa, at least one third of the patients additionally develop a reddish-blue discoloration of their fingers, clinically referred to as acrocyanosis. This acral syndrome sometimes gains clinical importance not only by increased cold sensitivity, but also by increasing social isolation due to stigmatization.

The aim of our study was to characterize the microvascular changes in anorexia nervosa by microcirculatory assessment and to determine discriminating factors for its appearance.

Patients and methods

Patients

We examined 34 patients (32 females, 2 males) suffering from anorexia nervosa. All patients were treated in an inpatient or outpatient setting in the Clinical Department of Psychosomatic and Psychosocial Psychiatry at the University of Innsbruck. The study protocol was approved by the Ethical Committee of the Medical Faculty of the University of Innsbruck.

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Diagnosis was made using the ICD-10 and DSM-IV criteria. A restrictive-anorectic type was distinguished from a binge-eating/purging type using self-induced emesis, diuretics or laxatives for weight loss [5].

Calorie intake was insured by administration of five high-caloric formula meals per day (Fresenius 750 MCT, Fresenius Kabi, Austria) during the initial indoor treatment phase (4–6 weeks). Thereafter nutrition consisted of two high-caloric formula intakes and three regular meals per day. Calcium and vitamin D was additionally supplemented (Cal-D-Vit^R, Roche, Austria) and gastral motility was stimulated by prescription of domperidone (Motilium^R, Janssen–Cilag, France).

All patients received pyschotherapy, adjuvant physiotherapy and ergotherapy.

All patients underwent a complete angiological examination including photo-pletysmography, capillary microscopy with laser-doppler anemometry and high-resolution brachial artery ultrasound.

Acrocyanosis was clinically defined by the presence of cold reddish-blue discolored fingers and hands, the induceability of a so-called "iris aperture sign" and facultatively an enhanced sweating of the affected palms and fingers [6,7].

Apparative examination

Finger artery occlusions were excluded by photopletysmography carried out from the fingertips D1–D5 using a commercially available photo-plethysmometer (Guttman, Germany).

Capillary light microscopy was performed with a Capiscope (KK-Research Technology LTD, UK) connected to a standard computer unit. Images were generated by a lens providing a magnification of $\times 200$ and a CCD camera giving high-resolution images of 752×582 pixels. The Capiscope contains a laser-doppler anemometer for measurement of flow velocities of single capillaries.

Capillary morphology was assessed according to the recommendations of the Microcirculatory Section of the German Society of Angiology (DGA) [8]. Capillary flow velocities were determined in the efferent capillary loops near the apex of five capillaries per finger and are expressed as means of these measurements.

Brachialis sonography was carried out following Celermajer et al. [9] with an HDI 5000 and a 5–12 MHz linear ultrasound transducer (ATL Ultrasound, USA). For determination of the arterial width the endothel-endothel diameter was used. Flow-mediated dilatation (FMD) and nitroglycerin-induced dilatation (NTG) were calculated by putting the basal vessel diameter as 100%.

Laboratory parameters

A total of 40 parameters were registered: Blood count, differential white blood count, glucose, creatinine, AST, ALT, trigycerides, total, HDL and LDL cholesterol,

TSH, fT3, fT4, serum-electrophoresis, C3c, C4, CRP, rheumafactor, cardiolipin-antibodies, ANA and leptin.

All blood samples were drawn from antecubital or cubital veins between 7 and 8 o'clock in the morning after a 12-h overnight fast.

Statistics

Statistical analysis was performed with SPSS 10.1 for Windows. Univariant comparisons of continuos variables between the groups of patients were done by unpaired *t* test or the nonparametric Mann–Whitney *U* test in case of nonnormally distributed variables. Dichotomized variables were compared using the likelihood ratio χ^2 test. A stepwise logistic regression model was used for identification of variables associated with the presence of acrocyanosis. Significance level was defined as $\alpha < .05$.

Results

Patients were classified as acrally symptomatic or nonsymptomatic according to the clinical appearance of acrocyanosis.

Table 1				
Clinical cha	racteristics and	laboratory data	of the study	oroung

			P
	Symptomatic	Nonsymptomatic	value
Ν	19	15	
Age (a)	23.3 (14-42)	23.2 (17-43)	.97
Height (cm)	165 ± 5.8	165 ± 7.37	.84
Weight (kg)	43 ± 6.09	45 ± 7.46	.40
BMI (kg/m ²)	15.8 ± 1.9	16.4 ± 1.8	.38
Δ BMI (admission			
to examination)	1.63 ± 1.86	0.93 ± 0.89	.19
Duration of anorexia (year)	5.8 (1 bis 25)	6.1 (1 bis 16)	.92
Pure fasting type	11 (58%)	4 (27%)	.072
Purging/bulimic type	8 (42%)	11 (73%)	
Smoker	4 (21%)	8 (53%)	.052
Nonsmoker	15 (79%)	7 (47%)	
Glucose (mg/dl)	79 ± 10	74 ± 9	.14
Creatinine (mg/dl)	0.84 ± 0.14	0.93 ± 0.15	.59
Cholesterol (mg/dl)	186 ± 30	200 ± 43	.24
HDL (mg/dl)	78 ± 18	65 ± 21	.56
LDL (mg/dl)	101 ± 26	122 ± 32	.045
Triglycerides (mg/dl)	72 ± 44	104 ± 47	.052
Leukocytes (G/l)	4.49 ± 1.284	6.02 ± 1.87	.008
Erythrocytes (T/l)	3.87 ± 0.45	4.11 ± 0.42	.11
Hemoglobin (g/l)	118.4 ± 29.2	128.8 ± 16	.22
Hematocrit (1/1)	0.36 ± 0.039	0.38 ± 0.045	.39
Thrombocytes (G/l)	293 ± 83	291 ± 76	.95
Segmentnuclear (%)	54 ± 9	51 ± 8	.30
Lymphocytes (%)	35 ± 8	38 ± 7	.37
Monocytes (%)	7.8 ± 2.6	7.3 ± 2.2	.55
Eosinophiles (%)	1.7 ± 0.9	2.9 ± 1.2	.003
Basophiles (%)	0.7 ± 0.36	0.7 ± 0.8	.99
Protein (g/dl)	7.2 ± 0.6	7.14 ± 0.86	.79
TSH (mU/l)	1.47 ± 0.8	1.4 ± 0.7	.83
Leptin (ng/ml)	2.60 ± 3.27	3.91 ± 5.11	.30

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