PERIPHERAL RHEOGRAM IN YOUNG ATHLETES

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The rheogram of young athletes has a flatter rise and fall of the curve, less clearly defined accessory waves, and a higher rheographic index than that of children not engaging in athletics.

In most cases in the literature the rheographic findings are described when a diagnosis of diseases of the peripheral circulatory system is made [1-8]. No reports could be found of the investigation of the peripheral circulation by rheography in young athletes.

The object of the investigation described below was to use a rheographic method to study the circulation in the lower limbs of healthy children aged 9-12 years systematically participating in light athletics for not less than 1 year and whose standard in athletics was up to juvenile grade I and adult grade III.

EXPERIMENTAL METHOD

Rheographic studies were carried out on 30 children taking part and on 15 children not taking part in athletics. The rheogram was recorded by the RG-01 rheographic instrument, connected to a five-channel electrocardiograph of the ÉKG-01 type. The electrocardiogram (ECG) was recorded synchronously in three standard leads together with the longitudinal rheogram of the right lower limb. The standard calibration signal (0.1Ω) recorded on the rheogram measured 10 mm. One lead electrode measuring 4 × 6 cm was placed on the lower third of the posterior surface of the leg, and another measuring 6 × 10 cm on the lower third of the anterior surface of the thigh. A thin baize pad soaked in special solution was placed beneath the electrode to prevent changes in resistance as the result of evaporation.

The character of the curve and the rate of spread of the pulse wave (t) from the beginning of the Q wave on the ECG to the beginning of rise of the pulse wave, the duration of the ascending part of the curve

TABLE 1. Rheographic Indices in Children Aged 9-12 YearsEngaging or Not Engaging in Athletics (M ± m)

Rheographic index	Children engaging in athletics	Children not engaging in athletics	P
Rate of spread of pulse wave t (in sec)	0,270±0,004	0,250±0,004	<0,001
Duration of ascending part of curve a (in sec)	0,130±0,002	0,118±0,002	<0,001
Duration of descending part of curve β (in sec)	0,491±0,023	0,405±0,027	<0,05
Amplitude of rheographic curve A (in mm)	16,5±0,405	15,0±0,430	<0,05
Rheographic index	1,65±0,038	1,50±0,040	<0,05
Ratio between durations of ascending part of curve a and descending part β (in percent)	26,4±0,435	29,5±0,469	<0,001
Ratio between durations of ascending part of curve a and total pulse wave a + β (in percent)	14,6±0,215	15,3±0,235	>0,05

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(α) from the beginning of rise of the pulse wave to its highest point, the duration of the descending part of the curve (β) from the highest point of the curve to the beginning of its ascending part, the amplitude of the rheographic curve (A), the rheographic index (RI) – the ratio between the height of A and the standard calibration signal (E), the duration of the ascending part of the curve (α) expressed as a percentage of the duration of the descending part of the curve (β) and of the duration of the total pulse wave ($\alpha+\beta$) were all analyzed. Three pulse cycles in each rheogram were examined and the mean indices calculated.

EXPERIMENTAL RESULTS

The rheograms of the young adults differed significantly from those of their contemporaries who did not engage in athletics. In more than half of the athletes the rise of the ascending part of the curve was more sloping. The shape of the maximum of their rheographic curve was slightly rounded, whereas in subjects not engaging in athletics a rounded maximum was found in only 5.7% of cases.

The descending part of the rheographic curve in the young athletes fell more steadily. Accessory waves (1-2, less frequently 3), found on the descending part of the curve, were situated mainly in the middle and lower parts, they were ill-defined, and their height did not exceed $\frac{1}{6}$-$\frac{1}{10}$ of the height of the rheographic curve. In children not engaging in athletics accessory waves were found along the whole curve. Their amplitude was higher and was $\frac{1}{4}$-$\frac{1}{8}$ of the amplitude of the main wave.

Quantitative indices on the rheograms recorded in the athletes also differed significantly from those obtained in children of the control group (Table 1).

Compared with the rheograms of children not taking part in athletics, the rheograms of the young athletes had a more sloping rise and fall of the rheographic curve, less marked accessory waves, and a higher rheographic index.

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