

OCCURRENCE OF THE "T-INFANTILE" PHENOMENON AND ITS AUTONOMIC SUPPORT IN YOUNG ATHLETES

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Actuality. Nowadays in the world of sports there are big competitions such as Gymnasiade, Youth Olympic Games, etc. in which athletes between 15 and 18 years of age participate. It is known that it takes an average of 6.5–7.5 years of hard training to achieve high results and successful participation in competitions at this level, so most coaches want to make an earlier selection of children in sports sections. Existing age standards for sports activities are based on the passport age, but due to the phenomenon of acceleration, there are cases of discrepancy between the passport age and the biological age, when a child is 1–2 years ahead or behind his or her peers. For example, children from the age of 7 are admitted to the initial training groups of children's and youth sports schools in gymnastics, artistic gymnastics, swimming, figure skating, tennis and table tennis. In such cases, during the initial medical examination, the sports physician encounters features of the ECG of young athletes in the form of a juvenile ECG pattern, better known as the "T-infantile" phenomenon.

The purpose of the study was to determine the prevalence of the juvenile ECG pattern in young athletes aged 6–17 years and the autonomic support of this ECG phenomenon.

Research methods. Electrocardiographic examination and recording of heart rate variability were performed in 3720 children and adolescents aged 6–17 years, including 74.6% (n=2774) boys and 25.4% (n=946) girls, involved in various types of sports. Of the total number of athletes, the "T-infantile" phenomenon was detected in 56 people, or 1.5%, including 40 (1.44%) boys and 16 (1.69%) girls. The state of the neurohumoral regulatory mechanisms of the heart, the activity of segmental and suprasegmental divisions of the autonomic nervous system (ANS) were assessed using mathematical and spectral methods of heart rate variability (HRV) analysis. ANS parameters were analyzed using an integral index of HRV, the stress index (SI).

Results. There were ten (25%) boys at age 9, eight (20%) at age 10, six (15% each) at ages 8 and 11, four (10%) at age 7, three (7.5%) at age 12, two (5%) at age 6, and one

(2.5%) at age 15. There were four (25%) girls at age 11, three (18.75% each) at ages 9 and 12, and one (6.25% each) at ages 7, 8, 10, 13, 16 and 17. Boys were involved in oriental martial arts — 22 (55%), sports games — 8 (20%), horting — 4 (10%), diving — 3 (7.5%), swimming — 2 (5%), fencing — 1 (2.5%). Girls were involved in sports games — 5 (31.25%), swimming — 5 (31.25%), martial arts — 2 (12.5%) and one (6.25%) each in diving, sports aerobics, rhythmic gymnastics and archery.

The highest number of young athletes with this ECG phenomenon was found in boys at the ages of 9 and 10, and in girls at the ages of 11, 9 and 12. The types of sport most frequently practiced by boys and girls were mainly martial arts and sports games, although nowadays an earlier age of starting sport is typical for all types of gymnastics (artistic, sports, aesthetic), figure skating, tennis, swimming and diving. Some differences in the occurrence of "T-infantile" in young athletes, compared with the results of other authors, may be related to the analysis of other sports in which the athletes studied participate, as well as to factors that take into account the gender of the child.

The next stage of our research was to analyze the ECG characteristics of young athletes with the "T-infantile" phenomenon. In boys with "T-infantile" (n=40), normal sinus rhythm was found in 80% (n=32) and right atrial rhythm in 20% (n=8). Regular rhythm was found in 80% (n=32) and sinus respiratory arrhythmia in 20% (n=8). Normal ECG amplitude was recorded in all boys. In the boys with "T-infantile" in 30% (n=12) the electrical axis of the heart was not deviated and was in a semi-vertical position, in 25% (n=10) it was vertical, in 7.5% (n=3) the axis was deviated to the right, in 5% (n=2) it was semi-horizontal and in one (2.5%) the heart axis was deviated to the left. Bradycardia was detected in 15% of the examined athletes (n=6), 42.5% (n=17) had heart rate in the range 61–79 bpm⁻¹ and the remaining 42.5% (n=17) had heart rate 80 bpm⁻¹ or more. ECG changes were present in 49 cases, i.e. in addition to T-infantile in five (10.2%) athletes in combination with incomplete right bundle branch block, in three (6.12%) with shortened PQ syndrome and in one (2.04%) with early ventricular repolarization syndrome.

In girls with T-infantile (n=16), normal sinus rhythm was found in 87.5% (n=14) and right atrial rhythm in 12.5% (n=2). Regular rhythm was found in 75% (n=12) and respiratory sinus arrhythmia in 25% (n=4). Normal ECG amplitude was recorded in all girls. In 43.75% (n=7) of the young female athletes the electrical axis of the heart had a semi-vertical position, in 25% (n=4) the electrical axis of the heart was not deviated and had a vertical position and in one (6.25%) the electrical axis of the heart was deviated to the right. Bradycardia was detected in 12.5% (n=2), heart rate in the range of 61-79 bpm⁻¹ in 50% (n=8) and in 37.5% (n=6) heart rate was 80 bpm⁻¹ or more. ECG changes were observed in 20 cases, i.e., in addition to "T-infantile", three girls (18.75%) additionally had incomplete right bundle branch block and one (6.25%) had short PQ syndrome.

A comparative analysis of heart rate variability values in boys and girls with the "T-infantile" phenomenon showed that boys, who were younger than girls (9.3±0.27 years vs. 11.1±0.68 years, p=0.02), had a significantly higher D value, reflecting the

activity of vagus regulation of heart rate (0.403 ± 0.028 s vs. 0.311 ± 0.025 s, $p=0.019$). They also showed a tendency to decrease the following indices AMo, a measure of the mobilising influence of the sympathetic arm of the autonomic nervous system ($36.321 \pm 2.059\%$ vs. $40.20 \pm 4.465\%$, $p=0.425$), AMo/D, an index of the ratio between sympathetic and parasympathetic activity (122.80 ± 16.18 %/s vs. 167.97 ± 37.58 %/s, $p=0.269$), autonomic rhythm index (ARI), indicating the balance of autonomic regulation of the sinus node (4.363 ± 0.376 1/s² vs. 5.307 ± 0.761 1/s², $p=0.265$), adequacy of regulation processes (ARP) – reflecting the correspondence between the activity of the sympathetic arm of the ANS and the leading level of sinus node function (52.869 ± 3.577 %/s vs. 58.814 ± 8.566 %/s, $p=0.517$), SI – stress index indicating the degree of centralisation of heart rate control (90.835 ± 12.904 conventional units vs. 127.226 ± 32.763 conventional units, $p=0.300$) and LF/HF-sympatho-vagal index (1.159 ± 0.188 conventional units vs. 1.413 ± 0.282 conventional units, $p=0.450$). The data obtained indicate a trend in the prevalence of parasympathetic influences of the ANS in boys.

Conclusions. The prevalence of the "T-infantile" phenomenon among young athletes aged 6 to 17 years was 1.44% for boys and 1.69% for girls ($p=0.945$), i.e. it didn't differ significantly between the genders. The highest percentage of young athletes with "T-infantile" was found in boys aged 9 and 10 years and in girls aged 11, 9 and 12 years. Boys were mainly involved in oriental martial arts and sports games, while girls were mainly involved in sports games and swimming. T-infantile phenomenon in boys and girls was associated with incomplete right bundle branch block and short QT syndrome.

Keywords: young athletes, juvenile ECG pattern, autonomic support, "T-infantile" phenomenon.