CHARACTERISTICS OF CARDIAC ARRHYTHMIAS AND SHORT PQ INTERVAL SYNDROME IN ADOLESCENTS

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Abstract: *Background. The phenomenon of a short PQ interval is characterized by the presence of a PQ interval of less than 120 ms on electrocardiography in adults and below the age-related norm in children, while maintaining a normal QRS complex and absence of arrhythmias. Short PQ interval syndrome is diagnosed when electrocardiographic changes are combined with episodes of paroxysmal supraventricular tachycardia. In adolescence, rhythm and conduction disturbances associated with a short PQ interval require careful clinical evaluation because of the possible development of clinically significant arrhythmias.*

Objective. *To study the characteristics of rhythm and conduction disturbances in adolescents with the phenomenon and syndrome of a short PQ interval.*

Materials and Methods. *A retrospective analysis of outpatient and inpatient medical records was conducted at the Adolescent Dispensary of Tashkent. The study included 40 adolescents aged 14–18 years diagnosed with a shortened PQ interval. Electrocardiographic findings, rhythm disturbances, conduction abnormalities, and associated hemodynamic and metabolic changes were analyzed.*

Results. *The mean age of the patients was 15±1.2 years. Girls accounted for 55% and boys for 45% of the study population. Rhythm and conduction disturbances were detected in 88% of cases. Arrhythmias associated with sinus node automaticity disorders were identified in 38% of patients, ectopic rhythms in 24%, conduction disturbances in 19%, paroxysmal tachycardia in 4%, and ventricular pre-excitation syndromes in 15%. Among sinus node automaticity disorders, sinus arrhythmia predominated (68%), while sick sinus syndrome was identified in 4% of patients. Among conduction disturbances, incomplete right bundle branch block was most common (84%), followed by sinoatrial block grade I–II (8%) and atrioventricular block grade I–II (8%).Ectopic rhythms were found in 35% of adolescents. Extrasystoles accounted for 47% of ectopic arrhythmias, atrial rhythm for 21%, migration of the sinus pacemaker for 21%, and parasystole for 11%. Ventricular extrasystoles predominated among extrasystolic arrhythmias (49%), including right ventricular (78%) and left ventricular (22%) forms. Atrial extrasystoles constituted 38%, whereas atrioventricular nodal extrasystoles accounted for 13%. Clinically significant rhythm disturbances were observed in 23% of cases, including allorhythmia (58%), atrioventricular dissociation (14%), sick sinus syndrome (14%), parasystole (14%), and trigeminy (14%). Hemodynamic and metabolic abnormalities included increased left ventricular load (29%), metabolic myocardial disturbances (25%), and increased electrical activity of the left ventricle (21%).*

Conclusions. *In most adolescents, a shortened PQ interval is detected as an incidental electrocardiographic finding. However, rhythm and conduction disturbances are highly prevalent in this population, particularly arrhythmias associated with sinus node dysfunction and ectopic atrial rhythms.*

Adolescents with a short PQ interval require careful clinical observation and dynamic electrocardiographic monitoring to prevent the development of severe and clinically significant arrhythmias.

Keywords: *short PQ interval, adolescents, arrhythmias, conduction disturbances, electrocardiography, extrasystole, sinus node dysfunction.*

INTRODUCTION

Cardiac rhythm and conduction disorders remain an important problem in pediatric and adolescent cardiology due to their high prevalence and potential risk of severe cardiovascular complications. One of the electrocardiographic phenomena attracting increasing attention is the shortened PQ interval. In clinical practice, a shortened PQ interval may represent either an isolated electrocardiographic finding or part of a pathological syndrome associated with supraventricular tachyarrhythmias and conduction abnormalities.

The PQ interval reflects atrioventricular conduction time from the atria to the ventricles. Normally, this interval varies according to age. In adolescents and adults, a PQ interval shorter than 120 milliseconds is considered shortened. The phenomenon of a short PQ interval is characterized by shortening of the PQ interval with preservation of a normal QRS complex and absence of tachyarrhythmias. In contrast, short PQ interval syndrome is diagnosed when electrocardiographic changes are accompanied by episodes of paroxysmal supraventricular tachycardia.

The pathophysiological mechanisms underlying shortened PQ intervals include accelerated atrioventricular conduction and the presence of accessory conduction pathways. These changes may predispose patients to the development of arrhythmias, conduction abnormalities, and hemodynamic disturbances. During adolescence, autonomic imbalance, hormonal changes, and rapid cardiovascular development may contribute to electrical instability of the myocardium.

Despite the clinical importance of this phenomenon, the prevalence and structure of arrhythmias associated with shortened PQ intervals in adolescents remain insufficiently studied. Early identification of rhythm and conduction disorders is essential for prevention of severe complications, including persistent tachyarrhythmias, syncope, and sudden cardiac events. The present study aimed to evaluate the characteristics of rhythm and conduction disturbances in adolescents with the phenomenon and syndrome of a shortened PQ interval.

Materials and Methods. The study was carried out at the Adolescent Dispensary of Tashkent. A retrospective analysis of outpatient and inpatient medical records was performed. The study included 40 adolescents aged between 14 and 18 years who had electrocardiographic evidence of a shortened PQ interval. Inclusion Criteria. Adolescents aged 14–18 years; Presence of a shortened PQ interval on electrocardiography; Availability of complete outpatient or inpatient medical documentation. Exclusion Criteria.

Congenital heart defects; Severe systemic diseases; Incomplete medical records. All patients underwent standard clinical examination and electrocardiographic evaluation. Electrocardiograms were analyzed for: rhythm disturbances; conduction abnormalities;

ectopic activity; ventricular pre-excitation syndromes; metabolic and hemodynamic changes.

The obtained data were statistically processed using descriptive statistical methods. Quantitative indicators were expressed as mean values with standard deviation, while qualitative variables were presented as percentages.

Results. General Characteristics of Patients. The average age of the adolescents was 15±1.2 years. Female patients constituted 55% of the study population, whereas male patients accounted for 45%. Rhythm and conduction disturbances were identified in 88% of adolescents with a shortened PQ interval, demonstrating the high prevalence of electrical cardiac abnormalities in this group.

Disorders of Sinus Node Automaticit. Arrhythmias associated with impaired sinus node automaticity were observed in 38% of patients and represented the most common group of rhythm disturbances.

Among these disorders: sinus arrhythmia was detected in 68% of cases; sick sinus syndrome was identified in 4% of adolescents. Sinus arrhythmia was predominantly functional and associated with autonomic imbalance. However, the detection of sick sinus syndrome is clinically important because it is considered a potentially life-threatening rhythm disturbance.

Conduction Disturbances. Conduction abnormalities were identified in 19% of patients. The most common finding was incomplete right bundle branch block, which accounted for 84% of conduction disorders. Other conduction abnormalities included: sinoatrial block grade I–II — 8%; atrioventricular block grade I–II — 8%. These findings indicate instability of impulse conduction in adolescents with shortened atrioventricular conduction time.

Ectopic Rhythm Disturbances. Ectopic rhythms were observed in 35% of adolescents. The structure of ectopic arrhythmias included: extrasystoles — 47%; atrial rhythm — 21%; migration of the sinus pacemaker — 21%; parasystole — 11%. Among extrasystolic arrhythmias, ventricular extrasystoles predominated and constituted 49% of all extrasystoles.The distribution of ventricular extrasystoles was as follows: right ventricular origin — 78%; left ventricular origin — 22%. Atrial extrasystoles accounted for 38%, while atrioventricular nodal extrasystoles represented 13%.

Clinically Significant Arrhythmias. Clinically significant rhythm disturbances were identified in 23% of patients. These included: allorhythmia — 58%; atrioventricular dissociation — 14%; sick sinus syndrome — 14%; parasystole — 14%; trigeminy — 14%. The presence of these arrhythmias indicates the potential risk of progression toward more severe electrical instability.

Hemodynamic and Metabolic Abnormalities. Electrocardiographic signs of hemodynamic and metabolic myocardial disturbances were also detected. The most common abnormalities were: increased left ventricular load — 29%; metabolic myocardial disturbances — 25%; increased electrical activity of the left ventricle — 21%. These findings may reflect adaptive and pathological myocardial changes associated with chronic electrical instability.

Discussion. The results of the present study demonstrate that adolescents with shortened PQ intervals frequently exhibit various rhythm and conduction disturbances. Although the shortened PQ interval is often regarded as a benign electrocardiographic finding, the high prevalence of arrhythmias identified in this study suggests the necessity of careful cardiological assessment.

The predominance of sinus node dysfunction may be related to autonomic nervous system imbalance characteristic of adolescence. Increased sympathetic activity and hormonal fluctuations can significantly influence cardiac electrophysiology during this developmental period.

The high frequency of ectopic activity, especially ventricular extrasystoles, deserves particular attention. Ventricular ectopy may indicate increased myocardial excitability and requires long-term monitoring, especially in patients with symptomatic arrhythmias or associated structural cardiac abnormalities.

Incomplete right bundle branch block was the most common conduction disturbance. In many adolescents this finding may be functional; however, in combination with shortened atrioventricular conduction, it may reflect disturbances in the cardiac conduction system requiring dynamic observation.

Clinically significant arrhythmias, including allorhythmia, atrioventricular dissociation, and sick sinus syndrome, highlight the importance of early diagnosis and regular electrocardiographic monitoring in adolescents with shortened PQ intervals. The findings of this study are consistent with current evidence suggesting that shortened PQ intervals may be associated with electrical myocardial instability and predisposition to supraventricular and ventricular arrhythmias.

Conclusion. A shortened PQ interval in adolescents is most commonly detected as an incidental electrocardiographic finding. However, rhythm and conduction disturbances occur in the majority of patients and may include clinically significant arrhythmias. The most common abnormalities identified in this study were: sinus node automaticity disorders; ectopic atrial and ventricular rhythms; incomplete right bundle branch block; ventricular extrasystoles. Given the possibility of progression to severe arrhythmias, adolescents with shortened PQ intervals require: regular cardiological evaluation; dynamic electrocardiographic monitoring; timely identification of clinically significant rhythm disturbances.

Early diagnosis and long-term follow-up may help prevent adverse cardiovascular outcomes and improve prognosis in this patient population.

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