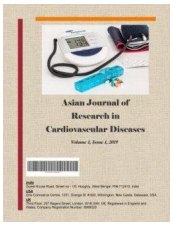

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# Results of Radiofrequency Ablation in Children

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***Author's contribution***

*The sole author designed, analysed, interpreted and prepared the manuscript.*

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## ABSTRACT

**Introduction:** The treatment of cardiac arrhythmias and conduction is one of the most difficult sections of clinical pediatrics. This is due to the variety of clinical forms of arrhythmias, the lack of a common understanding of the mechanisms of their occurrence, and, therefore, generally accepted treatment methods.
**Materials and Methods:** We performed 60 radiofrequency ablation procedures for 48 preschool patients with various types of arrhythmias, among them 25 children with WPW syndrome, 14 with atrial tachycardia, 3 with atrioventricular reciprocal tachycardia, 4 with ventricular tachycardia, 2 with extrasystoles. Radiofrequency ablation of arrhythmias in preschool children is effective and relatively safe.
**Results:** Factors associated with a high risk of recurrence after successful RF ablation is the minimally effective RF exposure parameters used to reduce the risks of various complications.
**Conclusion:** The use of navigational mapping in children significantly reduces radiation exposure during electrophysiological studies and radiofrequency ablation and reduces the potential risk of long-term complications.

*Keywords: Radiofrequency ablation; cardiac arrhythmias; children; arrhythmia; cardiac electrophysiology.*

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## 1. INTRODUCTION

Despite the similarities of many approaches, the treatment of arrhythmias in childhood differs from the postulates adopted in therapeutic practice due to the physiological characteristics of the child's body [1], the absence of typical causes of the development of arrhythmias in adults and, on the contrary, the existence of special conditions for their occurrence in some periods of life [2,3].

The range of diseases that can lead to the development of arrhythmias in childhood is quite wide:

1) Organic heart diseases (congenital and acquired heart defects, carditis, cardiomyopathy, endo- and pericarditis, arterial hypertension, heart tumors)

2) Congenital (genetically determined) pathology of the ion channels of cardiomyocytes and the cardiac conduction system

3) Extracardiac effects, among which the pathology of the central and autonomic nervous system is leading: perinatal damage to the central nervous system, trauma, brain tumors, neuroinfection, hereditary degenerative diseases, autonomic dystonia, etc [4,5,6].

In the etiology and pathogenesis of rhythm disturbances, structural features of the cardiac conduction system, hormonal disorders, toxic-allergic conditions, pathological impulses from internal organs, anemia, electrolyte imbalance, drug intoxications, etc. also matter [7].

In the treatment of arrhythmias, drug and non-drug methods are distinguished. Non-pharmacological methods include surgical, minimally invasive techniques (radiofrequency catheter ablation, cryodestruction, etc.) and the use of implantable antiarrhythmic devices [8].

These methods, of course, are highly effective and quite safe, however, in pediatric practice they are mainly used for the ineffectiveness of therapeutic approaches [9,10]. Drug methods can be divided into emergency and chronic pharmacotherapy. Emergency stopping requires rhythm and cardiac conduction disturbances with a high risk of developing heart failure, circulatory arrest and sudden cardiac death - ventricular tachycardia, which turns into fibrillation, and bradyarrhythmia [11,12,13]. To a much lesser extent, the supraventricular paroxysmal tachycardia can become a direct cause of circulatory arrest in children older than a year, although in infants it is a much greater danger due to the rapid development of heart failure [14,15].

The purpose of the study was to evaluate the effectiveness and safety of radio-frequency ablation of arrhythmias in children; identify factors affecting the frequency of recurrence of arrhythmias.

## 2. MATERIALS AND METHODS

To conduct the study, we studied the results of 60 radiofrequency ablation procedures for forty-eight preschool patients with various types of arrhythmias, among them 25 children with WPW syndrome, 14 with atrial tachycardia, 3 with atrioventricular reciprocal tachycardia, 4 with ventricular tachycardia - with extrasystoles. The age composition of patients at the time of primary radiofrequency ablation was as follows: children under 1 year (n = 8), children from 1 to 3 years (n = 7), children from 3 to 7 years (n = 33). The foreign experience of managing children with cardiac arrhythmias was also studied.

## 3. RESULTS

Direct intraoperative efficacy was 93.7%. Tachycardia recurred in 21.1% of patients. Repeated radiofrequency ablation was performed on 10 patients.

Among 9 patients who had intraoperative efficacy of repeated radiofrequency ablation, repeated relapses were observed in 2 children. All patients after an ineffective repeated procedure of radiofrequency ablation (n = 1) and with repeated relapses (n = 2) required an additional procedure of radiofrequency ablation against the background of the absolute ineffectiveness of antiarrhythmic therapy - in 3 of them, the procedure was effective and no further relapse was observed.

## 4. DISCUSSION

The delayed effect of radiofrequency ablation was observed in one patient with atrial tachycardia. The overall effectiveness of radiofrequency ablation taking into account repeated procedures performed due to the inefficiency of primary radiofrequency ablation

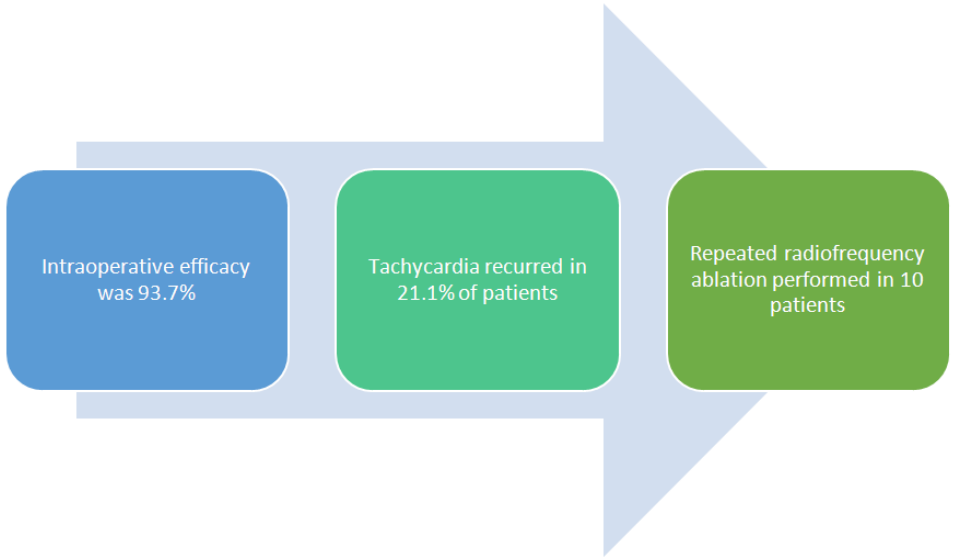


**Fig. 1. Results of the radiofrequency ablation in children of cardiac rhythm in children**

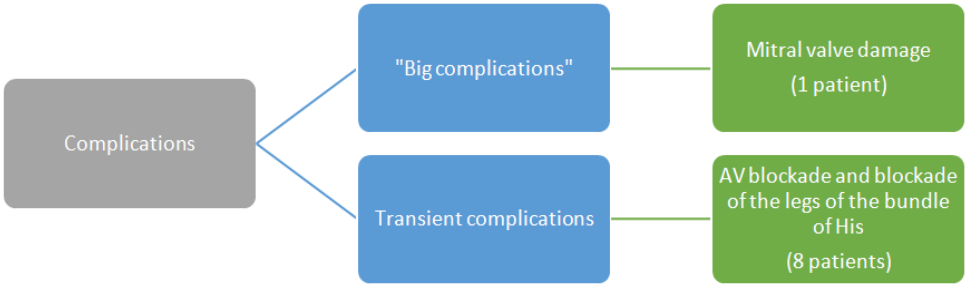


**Fig. 2. Intraoperative complications of radiofrequency ablation**

and relapse was 94.7% without statistically significant differences among children of different nosological and age groups.

As a result of a step-by-step regression analysis, it was revealed that the maximum power of effective applications during radiofrequency ablation is an independent predictor of relapse in our patients, a decrease of this indicator by 1 W increases the risk of relapse by 10.06%.

There were no statistically significant relationships between other parameters analyzed (age, nosological form of arrhythmia, other parameters of radio frequency exposure, localization of the arrhythmogenic zone, daily heart rate, severity of intracardiac hemodynamics) and the presence or absence of relapse. There was no mortality associated with radiofrequency ablation. Only 1 (1.1%) patient of 5 months of age had mitral valve damage, which belongs to the category of so-called "large" complications.

Transient complications were noted in another 8 (16.8%) patients, most of them - AV blockade and blockade of the bundle of the bundle of His associated with radiofrequency ablation of the CARTO system, resulting in a 2.3-fold reduction in fluoroscopy time, which was 12.5 ± tachycardia localized in the area of the AV node and bundle of His (p = 0,031). Twelve children underwent radiofrequency ablation of atrial tachycardia under navigational mapping using 8.33 min (2 to 31 min), compared to the time of fluoroscopy during radiofrequency ablation using standard fluoroscopic mapping, which was 28.14 ± 23.53 min (5 to 100 min) (p <0.001).

## 5. CONCLUSION

Radiofrequency ablation of arrhythmias in preschool children is effective and relatively safe. Factors associated with a high risk of recurrence after successful radiofrequency ablation are the minimally effective RF exposure parameters used to reduce the risk of complications.

The use of navigational mapping in children significantly reduces radiation exposure during electrophysiological studies and radiofrequency ablation and reduces the potential risk of long-term complications.

## CONSENT

Written informed consent was obtained from all participants' parents of the research for publication of this paper and any accompanying information related to this study.

## ETHICAL APPROVAL

The ethical approval for the study was granted by the Committee of Ethical Approval for Researches under the Ministry of Health of the Republic of Uzbekistan.

## ACKNOWLEDGEMENTS

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## COMPETING INTERESTS

Author has declared that no competing interests exist.

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