Factors of tachycardia-induced cardiomyopathy in children

Svintsova L., Dzaffarova O., Plotnikova I., Kovalev I., Batalov R., Popov S.

Research Institute for Cardiology, Tomsk, Russia

Importance

Clinical and predictive significance of tachycardia in children is detected by course of tachycardia-induced cardiomyopathy and heart failure

Aim

Assessment of clinical and hemodynamic parallels in preschool children with arrhythmias in different age groups

Study methods and materials

196 patients at the age from 0 to 7 years old (2,33 лет (IQR: 0,33 - 5,0) were examined
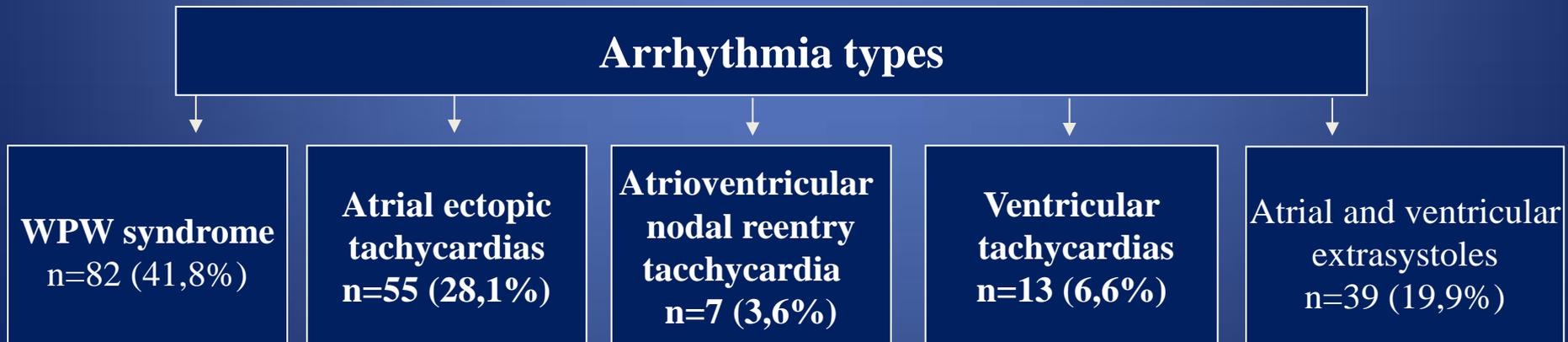
Inclusion criteria into the study:
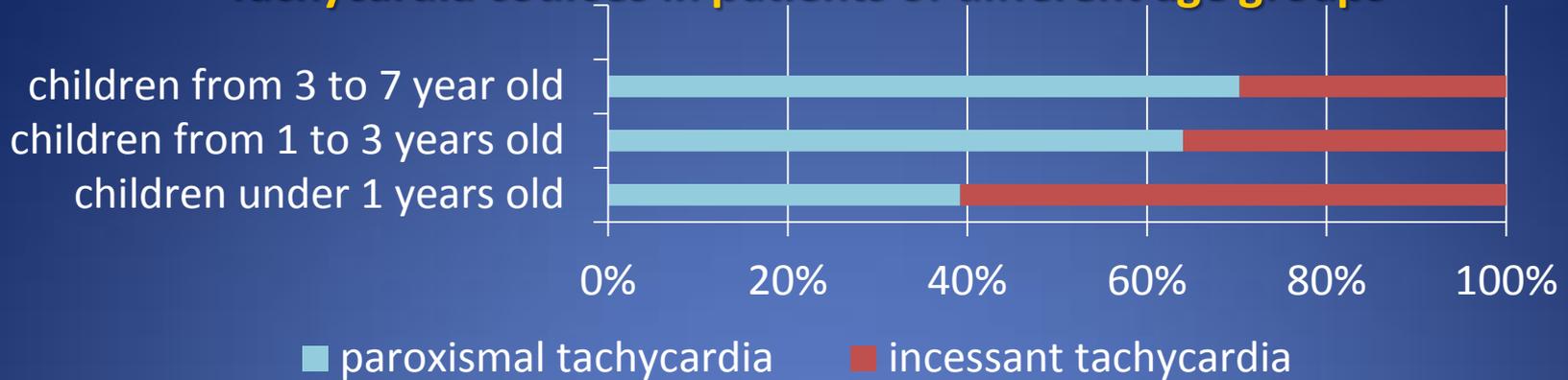
Absence of congenital heart diseases
Absence of cute and chronic illnesses

Age groups

infants – 36% (n=72); children of 1 - 3 years old – 19% (n=37); children of 3 - 7 years old – 44% (n=87)
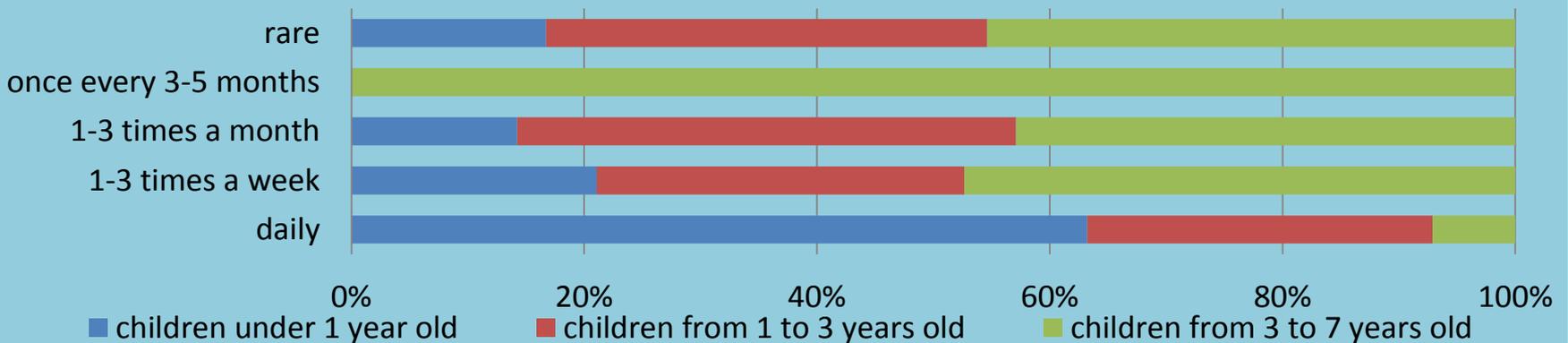
Arrhythmia types

| WPW syndrome n=82 (41,8%) | Atrial ectopic tachycardias n=55 (28,1%) | Atrioventricular nodal reentry tacchycardia n=7 (3,6%) | Ventricular tachycardias n=13 (6,6%) | Atrial and ventricular extrasystoles n=39 (19,9%) |

Tachycardia courses in patients of different age groups

children from 3 to 7 year old
children from 1 to 3 years old
children under 1 years old

0%   20%   40%   60%   80%   100%

■ paroxismal tachycardia   ■ incessant tachycardia

The predominant types of arrhythmias were paroxysmal tachycardias in 3–7-year-old children ($\chi2=11.077$, $p=0.001$) and incessant tachycardias in infants ($\chi2=13.030$, $p<0.001$).

Frequency of tachycardia attacks in children with paroxysmal tachycardia depending on age

rare
once every 3-5 months
1-3 times a month
1-3 times a week
daily

0%   20%   40%   60%   80%   100%

■ children under 1 year old   ■ children from 1 to 3 years old   ■ children from 3 to 7 years old

The frequency of paroxysmal tachycardia episodes was higher in infants compared with 1–3-year-old ($p=0.028$) and 3–7-year-old children ($p<0.001$).

Arrhythmogenic heart remodeling

Index	Age group			P intergroup
	Under 1 year old	1-3 years old	3-7 years old	
LA volume, %	**98,3** (89,7-126,0)	**106,0** (88,3-132,0)	**126,5** (104,0-165,0)	**0,001**
RA volume, %	**99,9** (80,7-137,0)	**112,0** (95,2-124,0)	**131,0** (116,0-151,0)	**<0,001**
EDV, %	**113** (84,1-131,4)	**117,5** (98,3-139,0	**112,5** (96,5-129,0)	0,488
LV EF	**66,0** (52,5-72,0)	**67,0** (60,0-70,0)	**65,0** (56,0-68,0)	0,708
RVSP	**25,0** (23,0-28,0)	**20,0** (19,0-22,5)	**23,0** (21,0-26,0)	**0,002**
Mean heart rate	**132,0** (120,0-147,7)	**112,0** (105,5-123,0)	**102,0** (94,0-109,0)	**<0,001**

Prevalence of ACMP characteristics in older children in correlation with young ones ($\chi2=12,312$, $p=0,002$) were disclosed in assessment of Echo CG indices in children with arrhythmias depending on age.

Correlation analysis confirmed dependence of Echo CG indices upon children's age - positive correlations of age and percentage of LA ($r=0,312$; $p<0,001$) and RA ($r=0,341$; $p<0,001$) volumes were discovered.

EDV indices were not significantly changed in children with arrhythmias depending on age, clinical significance, nosological entities and variants of arrhythmia course. In 11 children EDV was less than 80% of individually expected norm. All these patients were under 1 year old.

Heart failure
(NYHA)

NYHA	Age group			P intergroup	P paired		
	Under1 year old	1-3 years old	3-7 years old		P 1-2	P 1-3	P2-3
I	38 (52,8%)	31 (83,8%)	**70 (80,5%)**				
II	**16 (22,2%)**	5 (13,5%)	14 (16,1%)	**F=44,117**	**F=12,238**	**F=21,202**	F=0,828
III	**17 (23,6%)**	1 (2,7%)	2 (2,3%)	**p=<0,001**	**p=0,004**	**p<0,001**	p=0,934
IV	**1 (1,4%)**	0	1 (1,1%)				
Total	72 (100%)	37 (100%)	87 (100%)				

Clinical HF manifestations were disclosed significantly often in the group of children under one year old in comparison with children of older age groups.

Stages of arrhythmogenic cardiomyopathy development in children:

Children under one year old

-high heart rate
-normal ventricular sizes with relative increase of atriums sizes
-diastolic left ventricle dysfunction
-normal contractile function
-clinical signs of heart failure

Children older than 1 year old

-arrhythmogenic heart remodeling
-ventricular and atrium dilatation
-systolic ventricular dysfunction

Conclusion

Clinical ACMP manifestations in children till 1 year old are the symptoms of heart failure and diastolic dysfunction. Arrhythmogenic remodeling and systolic dysfunction is formed in children with arrhythmias older than1 year old. High average daily heart rate, conditioned by the tendency to incessant arrhythmia, and duration of arrhythmic history are the factors influencing on the given hemodynamic regularities.

E-mail: lis@cardio-tomsk.ru