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Hypertension management in children and adolescents

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Abstract

Due to the increasing prevalence of high blood pressure in children and adolescents the problem of diagnostics and management of hypertension in pediatrics has become more and more relevant in the last decades. Moreover, there are some specific trends in hypertension management in children and adolescents. This article highlights the main problems of diagnosis and treatment of hypertension in children and adolescents based on the Russian national guidelines for diagnosis, treatment and prevention of arterial hypertension in children and adolescents and the opinion of worldwide experts.

Kay words: hypertension, children and adolescents, essential hypertension, secondary hypertension

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Особенности тактики ведения детей и подростков с артериальной гипертензией

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Резюме

Проблема артериальной гипертензии в педиатрической практике в последние десятилетия становится более актуальной в связи с возрастающей повышенного артериального давления у молодых категорий населения. Ведение артериальной гипертензии у детей и подростков, в отличие от обычной практики, имеет ряд особенностей. В данной статье освещаются основные проблемы диагностики и лечения артериальной гипертензии у детей и подростков на основании Российских национальных рекомендаций по диагностике, лечению и профилактике артериальной гипертензии у детей и подростков и мнении зарубежных экспертов.

Ключевые слова: артериальная гипертензия, дети и подростки, гипертоническая болезнь, симптоматическая артериальная гипертензия

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Introduction

Hypertension (HTN) in children and adolescents is considered when a persistent increase in blood pressure (BP) more than the 95th percentile for a given gender and age is registered. Prehypertension prevalence in children achieves 10%, and HTN — 4% in general population [1, 2].

Where does HTN in children originate from? There is a large number of publications, which consider different factors affecting a fetus as a cause of HTN. A required vascular, metabolic, endocrine and other variants of adaptation to different effects in the fetus and in early childhood increase chances of survival, but result in structural and functional changes in different organs. These changes, together with "lifestyle" risk factors, lead to HTN in childhood, adolescence and in adults and manifest as a fetal programming phenomenon [3, 4].

There is a number of specific features of HTN clinical course in children and adolescents. Firstly, the prevalence of secondary (so called symptomatic) HTN is much higher than in adults. In children under 10 years old (i. e. in the pre-adolescent age) essential HTN is very rare, and a careful and comprehensive examination in order to determine the cause of BP elevation in a young patient is required.

Secondly, the characteristics of HTN, including assessment of BP lability, should be clarified. This is especially important in teenagers, as it determines the necessity of drug therapy.

Thirdly, the methods of evidence-based medicine are not applicable in children in order to identify the most effective and at the same time safe antihypertensive drugs in children, especially in the younger age group. This complicates the choice of the therapeutic approach.

Diagnosis

The current recommendations for screening and treatment of children and adolescents with HTN do not consider standardization of BP measurement methods, the choice of diagnostic and treatment approaches. There are centile tables for BP (percentile) assessment in children and adolescents depending on age, gender and height [5]. Hypertension is diagnosed if the mean BP is equal to or greater than the 95th percentile for a given age, gender and height. In children and adolescents, two degrees of HTN are distinguished. The first degree is established, when BP levels are equal to or more than the 95th percentile. The second degree (severe hypertension) is diagnosed when BP is more than 5 mmHg greater than the 99th percentile for the given age group based on three BP measurements by auscultatory method taken at different time [5, 6].

Essential hypertension is diagnosed in children and adolescents older than 16 years with persistent HTN during one year, or under 16 years old in case of target organ damage only after careful examination and exclusion of the secondary HTN. The prevalence of essential hypertension is less than 10% in children younger 10 years old, thus careful examination and search for the secondary causes of BP elevation is highly required in this group of children [7]. In different

Table 1

THE MOST COMMON CAUSES OF HYPERTENSION IN CHILDREN AT DIFFERENT AGE [5]

Under 1 year	1–6 years old	7–12 years old	Adolescents
Renal artery or vein thrombosis	Renal artery stenosis	Parenchymal kidney diseases	Essential arterial hypertension
Renal artery stenosis	Parenchymal kidney diseases	Renovascular pathology	Parenchymal kidney diseases
Congenital kidney anomalies	Wilms' tumor	Coarctation of aorta	Renovascular arterial hypertension
Coarctation of aorta	Neuroblastoma	Essential arterial hypertension	Adrenogenital syndrome
Bronchopulmonary dysplasia	Coarctation of aorta	Cushing's disease and syndrome	Pheochromocytoma
	Adrenal gland tumor (corticosteroma)	Pheochromocytoma	Cushing's disease and syndrome
	Cushing's disease (pituitary adenoma)	Nonspecific aortoarteriit (Takayasu's disease)	Periarteritis nodosa
	Pheochromocytoma	Periarteritis nodosa	
	Periarteritis nodosa		

age groups various forms of symptomatic HTN are dominated (Table 1).

Treatment

The aim of antihypertensive treatment is to achieve stable normalization of BP (less than the 90th percentile).

Preventi is the paramount purpose of HTN management in children and adolescents, as a timely risk factor correction prevents and/or slows down HTN development, target organ damage, and, therefore, reduces the risk of cardiovascular complications. The most significant risk factors of BP elevation are overweight, height and weight at birth, food and dietary habits from an early age (i. e. increased salt intake) and others.

Non-pharmacological treatment (lifestyle modification) should be applied at all stages of monitoring of a child with high-normal and elevated BP. It includes overweight reduction, physical activity optimization, smoking and alcohol cessation, healthy nutrition.

If there is no effect of non-drug treatment within 6–12 months, drug therapy can be prescribed. In the case of first-degree HTN and high risk or second-degree HTN drugs can be prescribed along non-drug therapy. Antihypertensive pharmacotherapy in children and adolescents should always start with monotherapy at minimal dose with the gradual titration to obtain the effect. The drug is changed to another, if there is no effect or the therapy is poorly tolerated. Combination therapy is acceptable at low doses, when monotherapy has no effect.

One of the key points is an opportunity to gradually withdraw of medications after effective therapy during not less than 3 months, and more preferably within 6–12 months.

All basic antihypertensive drug classes are used in children as well as in adult patients with HTN and include angiotensin converting enzyme (ACE) inhibitors, angiotensin II receptor blockers, calcium channel blockers, diuretics and beta-blockers. Their acceptability in children and adolescents is proved in several clinical trials. However, some drugs are included in the list based only on expert opinion. Antihypertensive drugs, recommended for children, and their dosage are shown in Table 2. The antihypertensive drugs are recommended in children and adolescents only if there is a certain experience of their use in given age category. In addition, treatment modulating autonomic disorders is reasonable in complex management of HTN. It includes drugs improving cerebral hemodynamic, nootropics and GABA-ergic drugs, sedative phytotherapy, as well as physiotherapy, acupuncture, massage and other non-pharmacological methods.

Long-acting drugs are preferred. The treatment is prescribed, according to the individual characteristics of each patient, age, and comorbidities.

Table 2

ANTIHYPERTENSIVE DRUGS RECOMMENDED IN CHILDREN AND ADOLESCENTS

Drug class	Drug name	Level of evidence	The initial dose (per os)	The maximum dose
ACE inhibitors	Captopril Enalapril Fosinopril Lisinopril Ramipril	RCT, SS RCT RCT RCT RCT	0,3–0,5 mg/kg/day (divided in 2–3 intakes) 0,08 mg/kg/day (once per day) 0,1 mg/kg/day (once per day) 0,07 mg/kg/day (once per day) 2,5 mg/kg/day (once per day)	450 mg/day 40 mg/day 40 mg/day 40 mg/day 20 mg/day
ARBs	Losartan Iresartan Candesartan	RCT RCT SS	0,75 mg/kg/day (once per day) 75–150 mg/kg/day (once per day) 4 mg/kg/day (once per day)	100 mg/day 300 mg/day 32 mg/day
BB	Propranolol Metoprolol Atenolol Bisoprolol/ Hydrochlorothiazide	RCT, EO RCT SS RCT	1 mg/kg/day (divided in 2–3 intakes) 1–2 mg/kg/day (divided in 2 intakes) 0,5–1 mg/kg/day (divided in 1–2 intakes) 2,5–6,5 mg/day (once per day)	640 mg/day 200 mg/day 100 mg/day 10/6,25 mg/day
CCBs (dihydropyridine)	Amlodipine Felodipine Nifedipine (sustained-release)	RCT RCT, EO SS, EO	0,06 mg/kg/day (once per day) 2,5 mg/day (once per day) 0,25–0,50 mg/kg/day (once per day or divided in 2 intakes)	10 mg/day 10 mg/day 120 mg/day
TD	Hydrochlorothiazide Chlortalidone Indapamide (controlled release)	EO EO SS, EO	0,5 mg/kg/day (once per day) 0,3 mg/kg/day (divided in 1 intake) 1,5 mg/day (once per day)	25 mg/day 25 mg/day 1,5 mg/day

Note: ACE inhibitors — angiotensin converting enzyme inhibitors; ARBs — angiotensin II receptor blockers; BB — beta-blockers; CCBs — calcium channel blockers; TD — thiazide diuretics; SS — several studies; EO — experts opinion; RCT — randomized clinical trials.

The first assessment of therapy efficiency is conducted after 8–12 weeks of treatment with subsequent control every 3–4 months. Efficiency control of non-drug treatment is carried out every 3 months.

It should be noted that in case of a medication prescribtion it is necessary to get written informed consent from the child's parents or the child (older than 14 years) before the medical treatment starts.

Disclosure
The authors declare no conflicts of interest.

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