

Hypertension (paediatrics)

Hypertension is an increase in blood pressure of more than **two standard deviations above the mean** for the child's age, height and sex ^[1]. A pressure increased more than two standard deviations above the mean corresponds to a blood pressure higher than the 95th percentile in the population. If the pressure is between the 90th and 95th percentile, or greater than or equal to 120/80 mmHg in adolescents, it is referred to as *normal high blood pressure* ^[1]. Percentiles are related not only to age and gender, but also to the child's height ^[1]. Hypertension is diagnosed based on **three different measurements in a non-stressful situation** ^{[1][2]}. When "*white coat syndrome*" is suspected (even more common in children than in adults), ambulatory twenty-four-hour blood pressure monitoring is used.

According to etiopathogenesis, hypertension is divided into primary (essential) and secondary (symptomatic - in 75-80% renal etiology) ^[3]. Its prevalence in children varies between **1-10%** ^[4]. In adults, the etiology is essential in the vast majority of cases (95%) ^[4], in children, on the other hand, secondary hypertension (renovascular, 80%) completely prevailed, only in adolescents the condition approached the adult population ^[4]. However, due to the increasing prevalence of childhood obesity, this situation is changing ^[5].

The level of blood pressure is determined by the filling of the vascular bed (depends on the minute cardiac output) and peripheral vascular resistance (depends on the functional and structural changes of the vascular bed). Arterial hypertension is the result of absolute or relative predominance of pressor, or lack of depressor mechanisms ^[3].

Measurements

Several methods are used to measure blood pressure, especially *auscultatory*, *oscillometric* and *invasive* measurements. For non-invasive measurement, a suitable cuff should be used, it should cover 40% of the area of the arm between the olecranon and the acromion ^[1], which corresponds to approximately 2/3 of the length of the arm. When measuring with the "auscultation method", the stethoscope should not touch the cuff ^[1]. When reading the diastolic pressure, the 5th Korotkov phenomenon (disappearance of murmurs) appears in some younger children at values approaching zero, therefore the 4th Korotkov phenomenon (weakening of murmurs) is then used ^[1].

Causes

Primary essential hypertension

The occurrence of essential hypertension is associated with the occurrence of obesity.

Renal

- renoparenchymatous: vesicoureteral reflux, glomerulonephritis, dysplastic kidneys, polycystic kidneys, hemolytic-uremic syndrome, pyelonephritis, obstructive nephropathy, kidney tumors producing renin, hydronephrosis, kidney injury, Wilms' tumor, systemic lupus erythematosus;
- renovascular: renal artery stenosis (fibromuscular artery dysplasia), renal vein thrombosis.

Cardiac/Vascular

- coarctation of the aorta, hypertensive form polyglobulia, persistent ductus arteriosus, vasculitis.

Endocrine

- Pheochromocytoma, Cushing's syndrome, corticoids, estrogens, sympathomimetics, hyperthyroidism or hypothyroidism, primary hyperaldosteronism, hypertensive form of adrenogenital syndrome, hyperparathyroidism, primary reninism.

Some CNS diseases

- inflammations, tumors, intracranial hypertension syndrome, poliomyelitis, polyradiculoneuritis. ^{[6][3][7]}

Intoxication with substances and drugs

- amphetamine, LSD, cocaine, ecstasy; ^[8]
- mercury^[9], lithium^[10], cocaine, amphetamine ^[11].

Most common causes by age

- newborns: thrombosis of the renal artery or vein, congenital kidney defects, coarctation of the aorta, umbilical cord catheterization, bronchopulmonary dysplasia;
- infants, toddlers, preschoolers: renal causes, coarctation of the aorta;
- younger school children: renal causes, primary hypertension;
- older school children and adolescents: primary hypertension, renoparenchymatous, drug-induced endocrine

diseases, coarctation of the aorta, monogenic diseases causing hypertension. [8]

Clinical picture

- arterial hypertension is mostly asymptomatic in children;
- with severe hypertension: headache, vertigo, epistaxis, visual disturbances. [7]

Diagnosis

- repeated measurement of blood pressure with the correct cuff (cuff width = 40% of arm circumference);
- 24-hour ambulatory blood pressure monitoring (ABPM) - display of diurnal rhythm, nocturnal pressure, exclusion of white coat syndrome;
- ions, creatinine, urea, uric acid, blood glucose, triacylglycerols, total cholesterol, LDL and HDL;
- thyroid hormones, cortisol, plasma renin activity and aldosterone;
- urine chemically and sediment; bacteriuria; microalbuminuria; creatinine clearance;
- kidney ultrasound – kidney size, parenchyma structure, flows in the renal arteries;
- echocardiography, ECG. [8][7]

Therapy

Goal: normalization of blood pressure, i.e. reduction < 90th percentile (or < 75th percentile in children with chronic kidney disease without proteinuria, < 50th percentile with proteinuria), prevention of the onset, or normalization of hypertensive damage to target organs that has already occurred (hypertrophy left heart ventricle, hypertensive retinal angiopathy). Controlling hypertension slows the progression of chronic renal insufficiency and reduces the risk of cardiovascular complications. Causal treatment according to the underlying disease.

Non-pharmacological

- reducing excess weight, limiting salt intake, regular physical activity;

Pharmacological

- indication: long-lasting hypertension, hypertensive involvement of target organs, symptomatic or secondary hypertension;
- **ACE inhibitors:** captopril (AN: neutropenia, exanthema, functional renal failure), enalapril (AN: transient hypotension), ramipril;
- **angiotensin receptor blockers:** losartan, irbesartan;
- **alpha- and beta-blockers:** propranolol (blockade of beta-adrenergic receptors, NU: bradycardia, bronchial obstruction, hypoglycemia), metoprolol;
- **calcium channel blockers:** nifedipine (NE: skin rash, reflex tachycardia, ankle swelling), amlodipine, nitrendipine, felodipine, isradipine;
- **diuretics:** hydrochlorothiazide, furosemide, spironolactone (diuresis, natriuresis, NO: hypokalemia). [8][7]

Hypertensive crisis

Hypertensive crisis is an acute, life-threatening condition that may present with heart failure, malignant renal changes, neurological symptoms (such as severe headache, changes in the fundus of the eye, convulsions) and requires immediate administration of a fast-acting antihypertensive. *Captopril* (short-acting ACE inhibitor), *sodium nitroprusside* (vasodilator), *labetalol* (combined α - and β -blocker), *diazoxide*, *hydralazine* (vasodilator) are used for treatment. A 20% reduction in blood pressure during the first hour is recommended. [3]

Links

Related article

- Arterial hypertension

References

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