

Neonatal hypertension ^{①②}

Clinical Features

Accutely ill neonate
Congestive heart failure
Cardiogenic shock
Intracranial hemorrhage
Life-threatening conditions

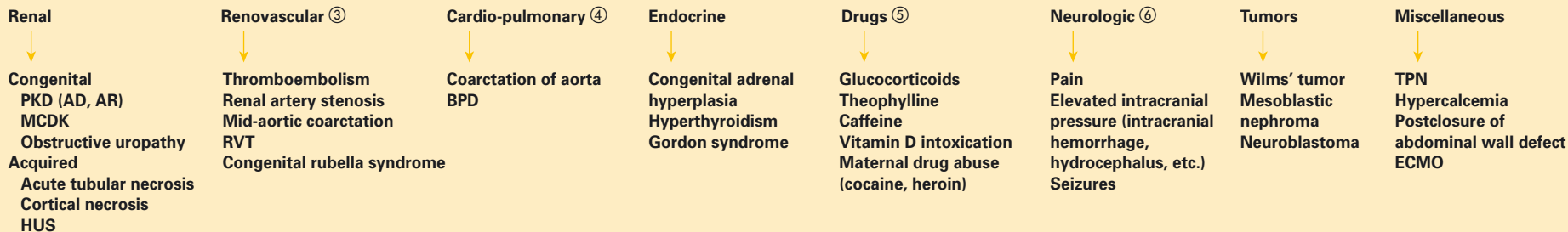
Less acutely ill neonate
Unexplained irritability
Failure to thrive ^⑦

History
Case and family histories
Medical procedures (e.g. umbilical artery catheterization)

Physical examination
Dysmorphic features, heart murmur, cyanosis, dyspnea/tachypnea, tachycardia, hepatosplenomegaly

Generally useful
Serum: CBC, BUN, creatinine, electrolytes, calcium
Urine: urinalysis (± culture)
Imaging: chest X-ray, echocardiogram renal sonogram and Doppler study

Useful in selected infants
Serum: PRA, cortisol, thyroid studies, aldosterone
Urine: catecholamines
Imaging: abdominal/pelvic sonogram, voiding cystourethrography, CT angiogram, nuclear scan (DTPA/Mag-3/DMSA)



① — BP is low at birth. It increases with age, by 1 mm Hg per day within the period of 3–8 days. It rises by about 1 mm Hg per week between ages 5 and 6 weeks. At a later age, systolic BP is around 95 ± 10 mm Hg. Hypertension is a rare condition in the neonate. Neonates with hypertension are at a high risk of developing cardiorespiratory failure and cerebral distress. In a neonate or infant, the BP is considered to be elevated if it is above the 95th percentile for infants of similar gestational or postconceptual age and size. For older infants (1–12 months), hypertension could be defined as blood pressure elevation above the 95th percentile for infants of similar age, size and gender.

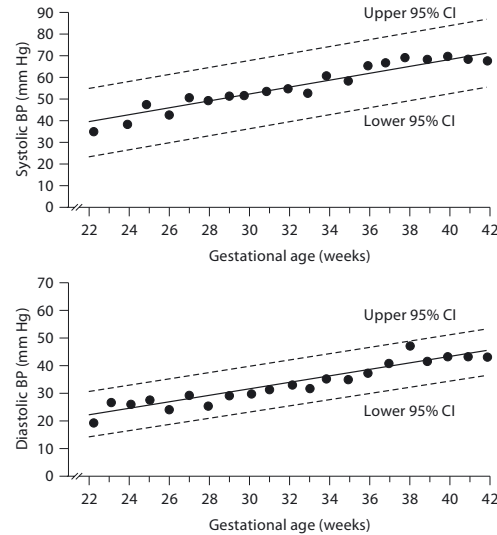
② — The actual incidence of hypertension in neonates is between 0.2 and 3%. As opposed to older children in whom hypertension is most commonly caused by renal or endocrine disorders, in neonates the common causes of hypertension are renovascular disease, cardiac malformations, as well as bronchopulmonary dysplasia.

③ — Umbilical artery catheter is the most common cause of hypertension in neonates. The catheter may lead to thrombus formation. The thrombi may embolize to the kidneys, causing areas of infarction and increased release of renin, which, in turn, elevates blood pressure. RVT is a relatively common cause of hypertension in asphyxiated or hypovolemic infants, infants with coagulopathies, as well as in infants of diabetic mothers.

④ — Coarctation of the aorta is the most common heart malformation that leads to hypertension in neonates. The hypertension in this condition is found in the upper extremities. The etiology of hypertension in BPD is probably multifactorial and includes prolonged glucocorticoid administration and chronic hypoxia.

⑤ — Various drugs may cause hypertension in neonates, either by direct administration to the sick neonate (glucocorticoids, theophylline), or due to maternal drug abuse that leads to hypertension in their infant child (e.g. heroin, cocaine).

⑥ — A common cause of hypertension in premature infants is intracranial hemorrhage.



Selected reading

- Brewer ED*: Evaluation of hypertension in childhood diseases; in *Avner ED, Harmon WE, Niaudet P* (eds): *Pediatric Nephrology*, ed 5. Philadelphia, Lippincott Williams & Wilkins, 2004, pp 1179–1198.
- Cordero L, Timan CJ, Waters HH, Sachs LA*: Mean arterial pressures during the first 24 hours of life in < or = 600-gram birth weight infants. *J Perinatol* 2002;22:348–353.
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- Friedman AL, Hustead VA*: Hypertension in babies following discharge from a neonatal intensive care unit. *Pediatr. Nephrol* 1987;1:30–34.
- Lee J, Rajadurai VS, Tan KW*: Blood pressure standards for very low birth weight infants during the first day of life. *Arch Dis Child Fetal Neonatal Ed* 1999;81:168–170.
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Table. Commonly used drugs for the treatment of neonatal hypertension

Drug	Class	Dose	Route	Comments
Diazoxide	vasodilator (arteriolar)	2–5 mg/kg per dose	rapid bolus injection	slow injection ineffective, duration unpredictable, use with caution, may cause rapid hypotension
Enalaprilat	ACE inhibitor	5–28 µg/kg/day	i.v. injection over 5–10 min	may cause prolonged hypotension and acute renal insufficiency
Esmolol	β-blocker	drip: 100–300 µg/kg per min	i.v. infusion	very short-acting constant infusion necessary
Hydralazine	vasodilator (arteriolar)	bolus: 0.15–0.6 mg/kg per dose drip: 0.75–5.0 µg/kg per min	i.v. bolus or infusion	tachycardia frequent side effect; must administer q 4 h when given i.v. bolus
Labetalol	α- and β-blocker	1.20–3.0 mg/kg per h	i.v. bolus or constant infusion	heart failure, BPD relative contraindications
Nicardipine	Ca ²⁺ channel blocker	1–3 µg/kg per min	constant infusion	may cause reflex tachycardia
Sodium nitroprusside	vasodilator (arteriolar and venous)	0.5–10 µg/kg per min	constant infusion	thiocyanate toxicity can occur with prolonged (>72 h) use or in renal failure