Neonatal hypertension

Clinical Features

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

Less acutely ill neonate
- Unexplained irritability
- Failure to thrive

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)

Renal
- Congenital PKD (AD, AR)
- MCDK
- Obstructive uropathy
- Acquired
  - Acute tubular necrosis
  - Cortical necrosis
- HUS

Renovascular
- Thromboembolism
- Renal artery stenosis
- Mid-aortic coarctation
- RVT
- Congenital rubella syndrome

Cardio-pulmonary
- Coarctation of aorta
- BPD

Endocrine
- Congenital adrenal hyperplasia
- Hyperthyroidism
- Gordon syndrome

Drugs
- Glucocorticoids
- Theophylline
- Caffeine
- Vitamin D intoxication
- Maternal drug abuse (cocaine, heroin)

Neurologic
- Pain
- Elevated intracranial pressure
- Hydrocephalus, etc.
- Seizures

Tumors
- Wilms' tumor
- Mesoblastic nephroma
- Neuroblastoma

Miscellaneous
- TPN
- Hypercalcemia
- Postclosure of abdominal wall defect
- ECMO
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. Neona
tes 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.

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.

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.

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.

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).

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

### Table. Commonly used drugs for the treatment of neonatal hypertension

<table>
<thead>
<tr>
<th>Drug</th>
<th>Class</th>
<th>Dose</th>
<th>Route</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diazoxide</td>
<td>vasodilator (arteriolar)</td>
<td>2–5 mg/kg per dose</td>
<td>rapid bolus injection</td>
<td>slow injection ineffective, duration unpredictable, use with caution, may cause rapid hypotension</td>
</tr>
<tr>
<td>Enalaprilat</td>
<td>ACE inhibitor</td>
<td>5–28 µg/kg/day</td>
<td>i.v. injection over 5–10 min</td>
<td>may cause prolonged hypotension and acute renal insufficiency</td>
</tr>
<tr>
<td>Esmolol</td>
<td>β-blocker</td>
<td>drip: 100–300 µg/kg per min</td>
<td>i.v. infusion</td>
<td>very short-acting constant infusion necessary</td>
</tr>
<tr>
<td>Hydralazine</td>
<td>vasodilator (arteriolar)</td>
<td>bolus: 0.15–0.6 mg/kg per dose, drip: 0.75–5.0 µg/kg per min</td>
<td>i.v. bolus or infusion</td>
<td>tachycardia frequent side effect; must administer q 4–6 h when given i.v. bolus</td>
</tr>
<tr>
<td>Labetalol</td>
<td>α- and β-blocker</td>
<td>1.20–3.0 mg/kg per h</td>
<td>i.v. bolus or constant infusion</td>
<td>heart failure, BPD relative contraindications</td>
</tr>
<tr>
<td>Nicardipine</td>
<td>Ca²⁺ channel blocker</td>
<td>1–3 µg/kg per min</td>
<td>constant infusion</td>
<td>may cause reflex tachycardia</td>
</tr>
<tr>
<td>Sodium nitroprusside</td>
<td>vasodilator (arteriolar and venous)</td>
<td>0.5–10 µg/kg per min</td>
<td>constant infusion</td>
<td>thiocyanate toxicity can occur with prolonged (&gt;72 h) use or in renal failure</td>
</tr>
</tbody>
</table>

Selected reading


