Neonatal Hypertension

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KEYWORDS

• Neonatal • Hypertension • Blood pressure • Oscillometric

KEY POINTS

- The incidence of neonatal hypertension remains low, at less than 2%, and the etiology of hypertension is varied.
- The most common cause of neonatal hypertension is renovascular disease, with umbilical artery catheter placement as a consistent risk factor. Most of the causes are determined by history and basic clinical investigations.
- Strict definitions of hypertension in neonates are unavailable, and the decision to treat is based on opinion rather than evidence guided by well-designed large, multicenter studies with definitive outcomes.
- More studies are needed to define normal blood pressure in this age group and to refine current reference values.
- Treatment is guided by clinical judgment and expert opinion, given the limited number of clinical trials.

INTRODUCTION

Neonatal hypertension (HTN) has been recognized for many decades.[1–3] HTN in the neonate is a difficult issue to define well, owing to a lack of good normative data. Nevertheless, there are clearly neonates with HTN, which may be severe with the potential for significant morbidity. This article focuses on diagnostic approaches to neonatal HTN and reviews treatment options.

SCOPE OF THE PROBLEM

The incidence of HTN in the neonatal period is low, and seems to range between 0.2% and 3%.[1,2,4–6] A recent study of infants admitted to a neonatal intensive care unit (NICU) used billing data to evaluate the incidence of HTN, risk factors associated with HTN, and patterns of use of antihypertensive medications in the NICU. Excluding infants with congenital cardiac disorders, approximately 1% of infants were coded for

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HTN. Risks for HTN on multivariate analysis included those with a high All-Patient Refined Diagnosis-Related Groups (APR-DRG) severity of illness assessment, exposure to extracorporeal membranous oxygenation, underlying renal disease, and history of renal failure. Nearly 60% of these infants were on antihypertensive medications, and nearly half received more than 1 medication.[7]

MEASURING BLOOD PRESSURE IN A NEONATE

Blood pressure (BP) is a constantly changing vital sign. There may be several factors that influence BP that must be considered, such as gestational age at birth, the infant's postnatal and postconceptual age, and the size of the infant relative to the gestational age. Maternal factors and perinatal events also contribute to the newborn's BP. The circumstances of the given infant must be considered when assessing the BP value obtained.[8]

Intra-arterial monitoring is considered to be the gold standard method for measuring BP in infants, and the common sites used for placement of a catheter include the umbilical artery, the radial artery, and the posterior tibial artery.[9] An extremely ill infant may warrant invasive monitoring, but most infants in a NICU will have BP measured indirectly with oscillometric devices. Ultrasonic Doppler monitoring is another method used in the NICU, but palpation and auscultation are not considered practical in this setting. The oscillometric technique of BP measurement is most commonly used.[10,11] With this method, a BP cuff is placed on a limb and inflated above the expected systolic pressure. The cuff deflates at timed intervals and the cuff detects vibrations or oscillations in the artery to determine the mean arterial pressure (MAP). The BP device then uses an algorithm to calculate systolic and diastolic BP. Comparisons between oscillometric BP and radial artery pressures have shown good correlation, which has been shown even in premature infants.[12] A suggested protocol for measuring BP in infants in a NICU was proposed by Nwankwo and colleagues,[13] and the elements of their protocol are listed in **Box 1**.

BP data from more than 300 infants on the first day of life have defined the mean and upper and lower 95% confidence intervals for BP.[14] This study showed that increases in BP occurred with both increasing gestational age and birth weight. More recently, Pejovic and colleagues[15] analyzed BP in stable premature and term infants admitted to the NICU, and showed that BP on the first day of life correlated with gestational age and birth weight. Premature newborns show a more rapid increase in BP over the first

Box 1
Method for standard neonatal blood pressure measurement

- Method: use oscillometric device
- Time of reading:
  - 1.5 hours after feeding for medical intervention/procedure
  - After cuff is placed, wait 15 minutes
- Position: prone or supine
- Extremity: right upper arm
- Infant state: asleep or quietly awake
- Number of readings: 3, at 2-minute intervals

Adapted from Nwankwo M, Lorenz J, Gardiner J. A standard protocol for blood pressure measurement in the newborn. Pediatrics 1997;99(6):E10.