Management of the Preterm Infant with Congenital Heart Disease

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KEYWORDS

• Prematurity • Low birth weight • Congenital heart disease • Congenital heart surgery • Cardiopulmonary bypass • Neonate

KEY POINTS

- Premature neonates are more likely to be born with congenital heart disease (CHD), and neonates with CHD are more likely to be born premature.
- Prematurity imparts significant morbidity and mortality risk in the neonate with CHD.
- Premature neonates with CHD may encounter hemodynamic instability during fetal transition as well as in the perioperative period.
- Management of premature neonates with CHD requires the collaboration of highly specialized providers from multiple disciplines.

INTRODUCTION

Premature newborns with CHD require unique considerations for optimal management. Despite obstetric advances and improvements in antenatal care, the rate of preterm delivery in the United States has increased in the past 20 years, and premature neonates have a more than 2-fold higher risk of cardiovascular abnormalities.[1,2] As antenatal diagnosis of CHD improves and fetal interventions expand, preterm infants with CHD will be a growing population.

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The standard definitions of prematurity and low birth weight (LBW) are described in Table 1. Infants may be LBW (due to prematurity alone) or small for gestational age (SGA). Cardiovascular abnormalities are associated with SGA[2–4] and a 2-fold risk of prematurity (<37 weeks' gestational age [GA][2]). Furthermore, congenital anomalies or genetic or chromosomal abnormalities are frequently associated with both CHD and intrauterine growth restriction.[5] Both gestational age and birth weight are important factors with regard to timing of delivery and timing of surgical repair.

TIMING OF DELIVERY AND OBSTETRIC CONSIDERATIONS

Although preterm delivery of infants with CHD may be indicated due to maternal or fetal issues, many cases of known CHD are scheduled to deliver at term gestation to facilitate coordination of care. The notion that all term babies with CHD have equivalent outcomes, however, was recently challenged by a large study of the Society of Thoracic Surgeons Congenital Heart Surgery Database.[6] This study found that outcomes were worse for neonates born at 37 to 38 weeks' gestation compared with those born at 39.5 weeks' gestation. These early-term infants had higher in-hospital mortality (adjusted odds ratio for mortality of 1.34 [1.05–1.71]), more postoperative complications, and prolonged length of stay. Other studies have confirmed a higher mortality rate[7,8] and greater resource utilization[9] with delivery of CHD infants at 39 to 40 weeks' gestation. Furthermore, Goff and colleagues[10] found that adjusted neurodevelopmental outcomes at age 4 years were significantly improved for infants with CHD born between 39 and 40 weeks' gestation compared with those born between 36 and 38 weeks' gestation. Delayed brain maturation by up to 1 month in infants with CHD has been demonstrated by fetal and postnatal MRI[11–13] and may contribute to the poorer neurodevelopment seen in even late preterm infants or early-term infants compared with those born at 39 to 40 weeks' gestation.

American College of Obstetricians and Gynecologists guidelines recommend a gestational age of at least 39 weeks for all elective deliveries, even in infants without CHD,[14] due to the increased risk for mortality and morbidity.[15] Therefore, unless obstetric or fetal concerns, such as preterm premature rupture of membranes, oligohydramnios, preeclampsia, hydrops, placental abnormalities, or nonreassuring fetal status exist, then elective delivery for infants with CHD ideally should be targeted for 39 to 40 weeks' gestation. Antenatal care coordination should include relocation of expectant mothers (at approximately 37 weeks' gestation) near a facility with specialized pediatric cardiac care to avoid unexpected spontaneous delivery at a more remote hospital.

Table 1
Categories for prematurity and low birth weight

	Gestational Age
Preterm	<37 wk
Extremely preterm	<28 wk
Late preterm	34–36 6/7 wk
Early term	37–38 6/7 wk
	Birth Weight
LBW	<2500 g
VLBW	<1500 g
ELBW	<1000 g