Indications for Mechanical Ventilation

68

Anne Greenough and Anthony D. Milner

I. Absolute Indications
   A. In the delivery room
      1. Failure to establish adequate spontaneous respiration immediately after delivery despite adequate face mask ventilation.
      2. A large diaphragmatic hernia. Affected infants should be intubated and ventilated. In some centers, infants are paralyzed from birth to stop them from swallowing, which can increase the dimensions of the bowel and worsen respiratory failure.
   B. In the neonatal intensive care unit
      1. Sudden collapse with apnea and bradycardia, with failure to establish satisfactory ventilation after a short period of face mask ventilation.
      2. Massive pulmonary hemorrhage. Such infants should be intubated, usually paralyzed, and ventilated with high positive end expiratory pressure.

II. Relative Indications
   A. In the delivery room
      1. Infants of extremely low gestational age may be electively intubated to receive prophylactic surfactant therapy, in some centers; infants will then be immediately extubated to CPAP. In other centers, continuous positive airway pressure is used as an alternative to elective intubation and mechanical ventilation and surfactant is given as "rescue" therapy.
      2. Infants <24 weeks of gestational age should be electively intubated and ventilated unless very vigorous at birth.
   B. In the NICU
      1. Worsening respiratory failure—the criteria will depend upon the gestational age of the infant
         a. <28 weeks' gestation: arterial carbon dioxide tension ($PaCO_2$) >45–55 Torr (6.0–7.3 kPa), the lower limit if associated with a pH <7.25 and/or arterial oxygen tension (PaO_2) <50–60 Torr (6.7–8 kPa) in a fractional inspired oxygen (F_iO_2) of greater than 0.50, although if the infants only has poor oxygenation, nasal CPAP may be tried first.

A. Greenough, M.D. (✉) • A.D. Milner, M.D.
Division of Asthma, Allergy and Lung Biology, King's College London, London, UK
e-mail: anne.greenough@kcl.ac.uk

S.M. Donn, S.K. Sinha (eds.), *Manual of Neonatal Respiratory Care*,
DOI 10.1007/978-3-319-39839-6_68

   b. 28–32 weeks' gestation: $PaCO_2$ >45–55 Torr (6.0–7.0 kPa), the lower limit being used if the pH is <7.25 and/or PaO_2 <50–60 Torr (6.7–8 kPa) in an F_iO_2 of greater than 0.6, if nasal CPAP has failed to improve blood gas tensions.
   c. ≥33 weeks' gestation: if the $PaCO_2$ exceeds 60 Torr (8 kPa) with a pH below 7.25 and/or PaO_2 <45 Torr (6 kPa) in an F_iO_2 of >0.80. CPAP is usually less well tolerated in mature infants. (N.B., in centers which prefer to use CPAP rather than intubation and mechanical ventilation, more severe blood gas abnormalities may be used as criteria for intubation).
2. Stabilization of infants at risk for sudden collapse
   a. Small preterm infants with recurrent apnea unresponsive to nasal CPAP and administration of methylxanthines
   b. Severe sepsis
   c. Need to maintain airway patency
3. To maintain control of carbon dioxide tension:
   a. Infants with pulmonary hypertension (e.g., congenital diaphragmatic hernia)
   b. Hyperventilation of infants to prevent cerebral edema (e.g., hypoxic ischemic encephalopathy).

Suggested Reading

Donn SM, Sinha SK. Assisted ventilation and its complications. In: Martin RJ, Fanaroff AA, Walsh MC, editors. Neonatal-perinatal medicine: diseases of the fetus and infant. 8th ed. St. Louis: Elsevier/Mosby; 2011. p. 1116–40.

Greenough A, Milner AD. Acute respiratory disease. In: Rennie JM, editor. Roberton's textbook of neonatology. 4th ed. Edinburgh: Elsevier Churchill Livingstone; 2005. p. 468–553.

Lista G, Fontana P, Castoldi F, Cavigioli F, Bianchi S, Bastrenta P. ELBW infants: to intubate or not to intubate in the delivery room? J Matern Fetal Neonatal Med. 2012;25:63–5.

Sant'Anna GM, Keszler M. Developing a neonatal unit ventilation protocol for the preterm baby. Early Hum Dev. 2012;88:925–9.