What are the indications for CPAP?

Recurrent spells of apnoea (pause in breathing > 20 seconds) are “almost universal” in infants < 34 weeks’ gestation (Lemyre, 2002). CPAP is used to support these infants, along with those recently extubated or with respiratory distress soon after birth (De Paoli, 2002). $P_{aO_2} < 50-60$ mm Hg whilst breathing > 40%-70% oxygen is regarded as a positive indication for CPAP in most units (Carlo, 2001).

A small retrospective randomised study (Dani, 2004) compared nasal CPAP with mechanical ventilation (MV) following surfactant therapy and extubation in preterm infants with respiratory distress syndrome. In the MV group, 6 patients (43%) were still dependent on MV at 7 days of life, vs no patients in the CPAP group.

Nasal CPAP reduces the incidence of adverse effects after extubation including failure (NNT 6; 95% CI 4-15) and chronic lung disease at 28 days (NNT 6; 95% CI 3-22) (Halliday, 2004). Data from a comparison of treatment of premature infants at the University of Vienna tertiary centre and the Vermont Oxford Neonatal Network as a whole (Kirchner, 2005) is also suggestive of an improved rate of retinopathy of prematurity (1-10% vs 8-12%) as well as chronic lung disease (14-32% vs 27-39%), when CPAP is used more often (45-86% vs 37-63%).

A randomised, multicentre trial in 1316 infants (Finer, 2010) assigned babies to intubation and surfactant treatment (within 1 hour after birth) or to CPAP treatment initiated in the delivery room, with subsequent use of a protocol-driven limited ventilation strategy. Infants were also randomly assigned to one of two target ranges of oxygen saturation. The primary outcome was death or bronchopulmonary dysplasia as defined by the requirement for supplemental oxygen at 36 weeks (with an attempt at withdrawal of supplemental oxygen in neonates who were receiving less than 30% oxygen). The rates of the primary outcome did not differ significantly between the CPAP group and the surfactant group (47.8% and 51.0%, respectively; relative risk with CPAP, 0.95; 95% CI, 0.85 to 1.05) after adjustment for gestational age, centre, and familial clustering. The results were similar when bronchopulmonary dysplasia was defined according to the need for any supplemental oxygen at 36 weeks (rates of primary outcome, 48.7% and 54.1%, respectively; relative risk with CPAP, 0.91; 95% CI, 0.83 to 1.01). Infants who received CPAP treatment, as compared with infants who received surfactant treatment, less frequently required intubation or postnatal corticosteroids for bronchopulmonary dysplasia ($P<0.001$), required fewer days of mechanical ventilation ($P=0.03$), and were more likely to be alive and free from the need for mechanical ventilation by day 7 ($P=0.01$). The rates of other adverse neonatal outcomes did not differ significantly between the two groups. The authors concluded that CPAP was a viable alternative to intubation and surfactant in preterm infants.


Not found an answer to your question? Contact bedsideclinicalguidelines@uhns.nhs.uk

Lemyre B, Davis PG, De Paoli AG. Nasal intermittent positive pressure ventilation (NIPPV) versus nasal continuous positive airway pressure (NCPAP) for apnea of prematurity. The Cochrane Database of Systematic Reviews 2002, Issue 1. Art. No.: CD002272

Evidence Level: I

What pressure range should be used?
No randomised trials have been identified on this question. Conventionally, a nasal CPAP of 5 cm H2O is used, rising in 1 cm increments to 10 cm. if there is no improvement. Higher levels may over-distend the lungs, leading to hypercapnia (De Paoli, 2002; Carlo, 2001).


Evidence Level: V

How should infants be weaned from CPAP?
"The optimal method of weaning infants from NCPAP remains unanswered" (Bowe, 2005). A postal survey of all 58 neonatal units with intensive care cots in the Northern Region (Bowe, 2005) found that 36 (66%) weaned on an ad-hoc basis by gradually decreasing pressure and that 16 (30%) had no set method. Only 3 units (6%) had a weaning protocol, although most (85%) felt that formal guidelines would be helpful.

A Cochrane systematic review of 3 trials (Jardine 2011) concluded that: “Infants who have their NCPAP pressure weaned to a predefined level and then stop NCPAP completely have less total time on NCPAP and shorter durations of oxygen therapy and hospital stay compared with those that have NCPAP removed for a predetermined number of hours each day. Future trials of withdrawing NCPAP should compare proposed strategies with weaning NCPAP pressure to a predefined level and then stopping NCPAP completely. Clear criteria need to be established for the definition of stability prior to attempting to withdraw NCPAP.”


Evidence Level: I

What types of CPAP are available?
The two most widely-used systems are conventional nasal CPAP and the Infant Flow Driver system. Conventional CPAP delivered with a conventional ventilator and nasal prongs was compared to the Infant Flow CPAP (IF CPAP) system in a prospective, randomised study of 162 intubated extremely low birth weight infants (Stefanescu, 2003). Individual extubation success rates were identical at 61.9% (52 of 84) in the CPAP group vs 61.5% (48 of 78) in the IF CPAP group. The IF CPAP group did, however, experience fewer days on supplemental oxygen and shorter hospital stays. Short binasal prongs (as in the Infant Flow system) produce more stable pressures (De Paoli, 2003) and are more effective than single prongs in reducing the rate of re-intubation (De Paoli,

Not found an answer to your question? Contact bedsideclinicalguidelines@uhns.nhs.uk
New generation facemasks that are more effective than those used originally, and that cause minimal nasal trauma, have recently been developed. No clinical comparisons with nasal prongs have yet been completed (De Paoli, 2003). A small study in 13 premature infants (Boumecid, 2007) suggests that variable-flow NCPAP increases tidal volume and improves thoraco-abdominal synchrony to a greater extent than is the case with constant-flow NCPAP and nasal prongs.


Evidence Level: II

Is bubble CPAP superior to conventional CPAP?

Few randomised studies have compared these two approaches, but those that have (Colaizy, 2004; McEvoy, 2004; Lee, 1998) have recorded reductions of up to 50% in the need for mechanical ventilation in favour of bubble CPAP. Another advantage is low cost: bubble CPAP equipment costs are 15% of those for mechanical ventilation, and the technique can be administered by nursing staff (Koyamaibole, 2006).

A retrospective outcome study (Narendran, 2003) found that early bubble CPAP reduced delivery room intubations, days on mechanical ventilation and postnatal steroid use (p<0.001). Increased postnatal weight gain at 36 weeks was also noted (p<0.05).

Bubbling is assumed to improve pulmonary gas exchange, although no such benefits were observed in a randomised crossover trial in 26 babies (Morley, 2005).


Evidence Level: II