Randomized Controlled Trial: Heated Humidity High Flow Nasal Cannula Versus Nasal CPAP for the Management of RDS in Extremely Low Birth Weight Preterm Infants in the Immediate Post Extubation Period

Elkhwad M*, Dako JA, Jennifer G, Harriet F and Anand K

Division of Neonatology, Department of Pediatrics, Akron Children Hospital, Akron, Qatar

***Corresponding author:** Elkhwad M, Division of Neonatology, Department of Pediatrics, Akron Children Hospital, Akron, Qatar, Tel: 330-5438352; E-mail: khwad2000@hotmail.com

Received date: January 17, 2017, **Accepted date:** January 22, 2017, **Published date:** January 30, 2017

Abstract

Background: Respiratory failure in neonates remains a difficult challenge and is associated with high morbidity and mortality. Current practice reflects the belief that limited exposure to invasive mechanical ventilation and careful use of oxygen support, results in less lung injury and improved long term pulmonary outcomes in preterm infants. Respiratory Distress Syndrome (RDS) is a common cause of respiratory failure in preterm infants and occurs in most preterm infants less than 28 weeks gestation. Standard of care involves surfactant administration and providing respiratory support.

Objective: To compare the primary outcome, failure of extubation defined by the need for re-intubation and mechanical ventilation within 5 days of initial extubation and secondary outcomes, morbidities and mortality after using of heated humidity high flow nasal cannula (HHHFNC) and Nasal Continuous Positive Airway Pressure (NCPAP) in the immediate post-extubation period for preterm infants between 24 and 28 weeks gestation with respiratory distress syndrome.

Methods: 60 preterm infants with f0 pretef%rt.he p Mexu 2 Po2

Demographics	Bubble CPAP (n=24)	Vapotherm (n=29)
Gestation age (wks) mean (SD)	26.71 (0.95)	26.76 (0.095)

As shown in Table 1, the average birth weight for infants in both groups was comparable at 950 grams, as well as gestational age of 26 weeks. There was no statistically significant difference regarding race, gender, prenatal steroids or Apgars scores between the two groups.

Primary outcome

HHHFNC use found to be comparable to the use of NCPAP As shown in Table 2, Mean duration of respiratory support was 6.5% lower using HHHFNC rather than NCPAP, 37.45 ± 23.12 (SD) vs. 40.04 ± 19.21 days. Neonates on NCPAP required less oxygen than those on HHHFNC, 43.75 ± 34.21 (SD) vs. 49.41 ± 39.68 days. But that was not statistically significant between the oxygen required for the two modes (p=0.58).

Secondary outcomes and adverse events

There was no statistically significant relationship between the mode of post-extubation and the need for mechanical ventilation within 5 days of initial extubation (p=1.000) as shown on Table 2. However, a lower percentage of neonates on HHHFNC failed extubation and required re-intubation within 5 days of initial extubation than neonates on NCPAP, 17.2% vs. 20.8%.

Measure	Bubble CPAP, mean, SD	Vapotherm, mean, SD	Mean Difference (95% CL)	t value (df=8)	P value
Oxygen Requirement	43.75 (34.21)	49.41 (39.68)	-5.66 (-26.33,15.00)	-0.55	0.58
Respiratory support	40.04 (19.21)	37.45 (23.12)	2.59 (-9)	0.44	0.66

	Statistic	p-Value
Association between ventilation Mode and need for mechanical ventilation within 5 days of extubation	Fisher's Exact	1
Association between ventilation Mode and intraventicular hemorrhage grade	Fisher's Exact	1
Association between ventilation Mode and Retinopathy of Prematurity grade	Fisher's Exact	0.6
Association between ventilation Mode and associated diagnosis of Patent Ductus Arteriosis	Chisq (df=1)	0.422
Association between ventilation Mode and associated diagnosis of sepsis	Fisher's Exact	0.318
Association between ventilation Mode and associated diagnosis of nasal breakdown	Fisher's Exact	0.006*

Table 4: Association of ventilation Mode and morbidities.

Discussion

Ventilation induced lung injury in very low birth weight infants is associated with increased morbidity, including increased susceptibility to infection and chronic lung disease [14-16]. Among extremely- low-birth-weight infants born at centers in the National Institute of Child Health and Human Development (NICHD) Neonatal Research Network between 1993 and 1997, immaturity was the leading cause of early death and pulmonary conditions was the predominated cause of death for those surviving for late death [17]. Changes in neonatal care since this period, including changes in prenatal use of glucocorticoids and antibiotic agents, use of surfactants, and ventilation strategies may have led to a relative decrease in deaths attributable to pulmonary causes [18].

As a consequence, many centers encourage the use of non-invasive ventilation, primarily NCPAP as a mode of ventilation for neonates with RDS, following surfactant administration. In recent times, high fow humidifed oxygen appears to be increasingly used compared with NCPAP as a result of perceived benefts which have not been convincingly proven [5].

In a survey done by Ojha et al. demonstrated that H HHFNC is a widely used modality in UK neonatal units, and 34 units of the 44 who responded use the module. 39% units used vapotherm without policies. Most of these units reported use of Vapotherm in infants of any gestation (24/34, 71%) and weight (26/34, 77%) and for a variety of indications including as an alternative to CPAP (26/34, 77%), weaning of CPAP (24/34, 71%) and postextubation (18/34, 53%). T e fow rates, cannula size and mouth position varied widely [5].

Many questions continue to be raised with regards risk of sepsis and unknown airway end distending pressure despite the advantage of decreased nasal trauma.

Our results from this study, suggests no signifcant increase in failed extubation following administration of at least two doses of surfactant in preterm neonates with RDS. 17.2% of neonates placed on HHHFNC failed extubation and required re-intubation within fve days of initial extubation compared with 20.8% of neonates placed on NCPAP (p=1.000). T is contrasts with a previous study published in 2006 by DM Campbell, et al. where 12 of 20 infants randomized to HHHFNC required re-intubation within seven days compared with 3 of 20 infants randomized to NCPAP (p=0.003). Of the 12 who failed exubation in the HHHFNC group, 7 were reintubated within 48 hours [7]. But our results were consistent with a recent randomized, controlled, unblinded noncrossover trial in 432 infants ranging from 28 to 42 weeks' gestational age with planned nCPAP support, as either primary therapy or postextubation [19]. Another study by Collins et al who randomized a total of 132 ventilated infants younger than 32 weeks' gestation receives either HHHFNC or NCPAP [20]. In his study HHHFNC and NCPAP produced similar rates of extubation failure. Nasal-trauma scores were lower in the nasal-cannulae group than in

References

1. Gregory GA, Kitterman JA, Phibbs RH (1971) Treatment of idiopathic respiratory distress syndrome with continuous positive airway pressure.