Comparison of Three Different Noninvasive Ventilation Strategies as Initial Respiratory Support in Very Low Birth Weight Infants

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Background: Nasal continuous positive airway pressure (NCPAP) has been widely used for the respiratory support of preterm infants in many neonatal intensive care units. However, studies using NCPAP as initial respiratory support in respiratory distress syndrome (RDS) have reported noninvasive ventilation (NIV) failure rates of 25-50% which has led to the use of alternative NIV strategies such as nasal intermittent positive pressure ventilation (NIPPV) or bi-level positive airway pressure (BiPAP).

Objective: To compare the failure of NIV and neonatal outcomes between NCPAP, BiPAP and NIPPV as the initial respiratory support with less invasive surfactant administration (LISA) in very low birth weight (VLBW) infants.

Methods: Medical records of 419 VLBW infants born at 26-30 weeks’ gestation who did not require intubation in the delivery room and were initially supported with either NCPAP (n:221), BiPAP (n:101), or NIPPV (n:97) were retrospectively reviewed. LISA approach was preferred in case of surfactant requirement. The primary outcome was the failure of NIV within the first 72 hours of life.

Results: Patient characteristics’ of the groups were similar (Table 1). The failure of NIV within the first 72 hours of life was significantly higher in the NCPAP group (29.4%) compared to the BiPAP (12.9%) or NIPPV (12.4%) group (p<0.001) (Table2). However, BiPAP and NIPPV groups were similar in terms of NIV failure (p=0.91). Multivariable logistic regression analysis showed that antenatal steroid administration (OR: 0.45, 95% CI 0.26-0.80; p<0.001) and NCPAP support (OR: 3.08, 95% CI 1.81-5.22; p<0.001) were independent factors that influence failure of NIV within the first 72 hours of life. There was no difference between the groups in terms of preterm morbidity (Table 3).

TABLE 1. Characteristics of the patients

	NCPAP (n=221)	BiPAP (n=101)	NIPPV (n=97)	p
Birth weight (g)*	1080 ±212	1083 ±194	1112 ±215	0.43
Gestational age (week)*	28.1 ±1.1	28.2 ±1.1	28 ±1	0.47
SGA, n (%)	26 (11.8)	9 (8.9)	10 (10.3)	0.73
Male gender, n (%)	101 (45.7)	51 (50.5)	54 (55.7)	0.25
Caesarean delivery, n (%)	185 (83.7)	85 (84.2)	83 (85.6)	0.91
Antenatal steroids, n (%)	172 (77.8)	79 (78.2)	77 (79.4)	0.95
APGAR score at 5 min†	8 (7-8)	8 (7-8)	8 (7-8)	0.18
Multiple births, n (%)	48 (21.7)	25 (24.8)	22 (22.7)	0.83
Preeclampsia, n (%)	46 (20.8)	20 (19.8)	23 (23.7)	0.77
Chorioamnionitis, n (%)	24 (10.9)	11 (10.9)	9 (9.3)	0.9

*mean±SD †median, interquartile range (IQR). SGA, Small for gestational age (below the 10th centile)

TABLE 2. Primary and secondary outcomes in study groups

	NCPAP (n=221)	BiPAP (n=101)	NIPPV (n=97)	p	
Primary outcomes					
NIV failure in the first 72 h of life, n (%)	65 (29.4)	13 (12.9)	12 (12.4)	<0.001	0.001 ^{a,b}
Secondary outcomes					
Required surfactant, n (%)	130 (58.8)	42 (41.6)	40 (41.2)	0.002	0.004 ^{a,b}
Overall rate of intubation, n (%)	101 (45.7)	31 (30.7)	32 (33)	0.01	0.01 ^a , 0.03 ^b
Duration of MV, days*	0 (0-3)	0 (0-2.5)	0 (0-2)	0.17	
Duration of NIV, days*	5 (2-12)	4 (2-8)	4 (2-7)	0.09	
Duration of supplemental oxygen, days*	10 (4-22)	6 (3-13.5)	5 (2-11)	<0.001	0.002 ^a , <0.001 ^b
Pneumothorax, n (%)	6 (2.7)	3 (3)	3 (3.1)	0.97	
BPD, n (%)	29 (13.1)	9 (8.9)	8 (8.2)	0.32	
Survival without BPD at 36 weeks PMA, n (%)	172 (77.8)	84 (83.2)	79 (81.4)	0.49	

*median, interquartile range (IQR). BPD, Bronchopulmonary dysplasia; NIV, Non-invasive ventilation; PMA, Postmenstrual age. p: Comparison of all 3 groups; pa: Comparison of NCPAP with BiPAP; pb: Comparison of NCPAP with NIPPV

TABLE 3. Preterm morbidities of study groups

	NCPAP (n=221)	BiPAP (n=101)	NIPPV (n=97)	p
hsPDA, n (%)	66 (29.9)	31 (30.7)	28 (28.9)	0.96
IVH> grade II, n (%)	13 (5.9)	4 (4)	5 (5.2)	0.77
Periventricular leukomalacia, n (%)	11 (5.1)	3 (3)	4 (4.2)	0.70
Spontaneous intestinal perforation, n (%)	4 (1.8)	1 (1)	1 (1)	0.78
NEC≥ stage II, n (%)	4 (1.8)	-	2 (2.1)	0.37
ROP that required laser treatment, n (%)	18 (9)	6 (6.8)	5 (5.3)	0.51
Duration of hospitalisation, days*	65±22.8	57.4±23	54.4±22.9	<0.001*

NEC, Necrotising enterocolitis; ROP, Retinopathy of prematurity.

Conclusions: NIPPV or BiPAP as the initial respiratory support with LISA approach reduced the need for invasive ventilation in infants born at 26-30 weeks’ gestation.

References:

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