Efficacy of Using Synchronized Nasal Intermittent Positive Pressure (SNIPPV) Versus Ordinary Continuous Positive Airway Pressure (CPAP) in Sick Neonate

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Disclosure:

The authors certify that they do not have any conflict of interest or financial relationship with any commercial entity that has an interest in the subject of this manuscript.

Abstract

Background: Nasal continuous positive airway pressure (NCPAP) for respiratory support reduces the need of endotracheal intubation and mechanical ventilation. A new mode with continuous positive pressure including a CPAP with intermittent mechanical rate synchronized with breathing SNIPPV.

Objectives: Assessing effectiveness and safety of this mode SNIPPV with the ordinary CPAP.

Methods: A prospective study on neonates with apneas and/or respiratory distress or fit for extubation randomized to receive the ordinary CPAP group1or receive the SNIPPVgroup2.

Result:18 case in each group, in both males needed more support than females, no death among group 1 while1 case died in the second group, Apgar score mean nearly same for both groups it was 7.2&9.2 at 1&5 minutes group1 compared to 6.9& 8.8 at 1&5minutes group 2,1case in each group got PIE,2 cases in group1 had PDA compared to 3cases in the group 2, no cases of group1cases failed while 4cases in group 2 failed this support(p 0.032), no cases in group one develop CLD compared to two cases group two, no intestinal perforation in both groups.

in short and long term **Conclusion:** According to the data there was no significant difference outcome between the ordinary CPAP and the SNIPPV when they used for sick neonates.

Introduction

the majority of preterm infants born before 34 weeks gestation experience apnea of prematurity in the first 10 days of life (Barrington 2002)[4]. Apnea in infants has been defined as a pause in breathing of greater than 20 seconds or an apneic event less than 20 seconds associated with bradycardia and/or cyanosis (Nelson 2008),Nasal continuous positive airway pressure NCPAP has

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been reported to be an effective treatment for apneas (Andréasson & Miller 2000).A new development arises in the mechanism of delivering the continuous positive pressure including a CPAP with intermittent mechanical rate synchronized with infant breathing NIPPV. We are assessing the effectiveness and safety of this new mode of CPAP delivery system in a prospective randomized controlled trial.

Methods

A randomized prospective case controlled study, any neonates if develop apneas and/or respiratory distress or fit for extubation from mechanical ventilation will be randomized to one of two groups .Group one a control group receive the ordinary CPAP group two receive the SNIPPV.CPAP will be delivered using the infant flow CPAP (PEEP only), SNIPPV delivered using Infant flow Advance EME with back up rate, inspiratory time and PEEP.

Inclusion criteria:

All neonates admitted to NICU who develop respiratory distress/apneas required respiratory support or if the treating physician decided extubation (at a desecration of the treating physician).

Exclusion criteria:

- Severe respiratory distress that intubation and mechanical ventilation in indicated.
- Conditions that CPAP application is contraindicated as in postoperative.
- Gastrointestinal repairs or necrotizing enterocolitis.
- Congenital anomalies incompatible with life.

Failure of the CPAP/SNIPPV if:

- Clinical and/or blood gas deterioration (PH <7.20, Pco2 >60 in capillary or arterial blood gas sample and PaO2<50 arterial blood gas) and increase oxygen requirement of more than 40% FiO2.
- Deterioration in the x-ray and/or development of lung collapse.
- Recurrent apnea of more than one moderate over 6 hours or one single severe at any time , infant then will be intubated and receive pressure support mechanical ventilation. Apneas defined as mild when infant needs only tactile stimulation, moderate when infant needs vigorous tactile stimulation and increase in flow of oxygen only and sever when infant needs positive pressure ventilation.

Success of CPAP/NIPPV:

- Off CPAP/NIPPV for 72hrs.
- Infant requires less than 40% FiO2.
- Stable blood gases (PH>7.25, and Pco2 <60 in capillary or arterial blood gas sample and Pao2>50 arterial blood gas).
- Hemodynamically stable (mean blood pressure, heart rate).

Blood gas monitor:

Patient will be monitored with blood gas every 6 hours in the first 48hours then every 12 hours thereafter for 48hours then once daily if clinically stable. PEEP will be reduced gradually guided by the oxygen saturation monitor to maintain oxygen saturation between 90-95%, apnea free decrease work of breathing and resolving chest x-rays.

Consent:

A written consent was taken for each neonate recruited in the study from his/her parents.

Results

36 cases were recruited & finished the study, group one had 18 cases (mean gestational age the mean gestational age were 30.7 weeks) for whom ordinary CPAP applied compared to 18 cases (mean gestational age were 29.3 weeks)in group two for whom advanced synchronized CPAP(SNIPPV) applied, in both groups male needed more support than female (table (1)) no death among first group while one case died in the second group , Apgar score mean nearly same for both groups (table no.1,antenatal steroid also nearly same(table (1)), one cases of group one had IVH(but no PVL) while no cases recorded to had it in group two(while one case recorded to had PVL).group one cases less needed caffeine than group two(table no.1),less cases in group one given surfactant(table (1)),one case in each group got PIE ,two cases in first group had patent ductus arteriosus compared to three cases in the second group, no cases of group one cases failed while 4 cases in group two failed this support, no cases

died in group one while one case died in group two, no cases in group one develop CLD compared to two cases develop CLD in group two , no intestinal perforation in both groups.

Table (1): Demographic clinical characteristics of both groups' data

VARIABLE	CPAP No.18& %	SNIPPV No.18& %	P VALUE
Gestational Age	30.8wks+2.5	29.2wks+2.53	0.277

Weight(mean)	1050grams	1001grams	0.81
Gender	M*=11(61%) F* = 7(39%)	M*=10(57%) F*=8(44%)	0.74
MOD*	ND*=9(50%) CS*=9(50%)	ND*=7(39%) CS*=11(61%)	0.50
FAILURE	1(5.6%)	4(22%)	0.032
SURFACTANT	4(22%)	14(78%)	0.001
PIE*	1(5.6%)	1(5.6%)	1.00
CAFFIENE	10(57%)	15(83%)	0.07
ANT. STEROID	11=61%	12=67%	0.73
PNEUMOTHORAX	0	0	=====
CLD* 36WK	0(0%)	2(11%)	0.15
CLD*28	1(5.6%)	2(11%)	0.15
PDA*	2(11%)	3(17%)	0.63
IVH*	1(5.6%)	0(0%)	0.31
PVL*	0(0%)	1(5.6%)	0.31
ROP*	0	0	=====
NEC*	0	0	=====
DEATH	0(0%)	1(5.6%)	0.30

Table (2): comparison of continuous variables of the study data

VARIABLE	CPAP (Mean+ sd)	SNIPPV (Mean + sd)	P VALUE
Gestational Age	30.8wks+2.5	29.2wks+2.53	0.277
APGAR 1	7.21.+76	6.9+1.51	0.62
APGAR 5	9.2+0.81	8.8+0.83	0.097
DAYS OF USE	1.83+2.2	2.1+1.5	0.7

PRE.APNEA	1	2	0.765

Table (3): Pre-application Data

Pre-application/Mean	CPAP (Mean +sd)	SNIPPV (Mean +sd)	P VALUE
RESP. RATE	54	54	0. 234
PCO2	44	44	0.837
FIO2 (HRs*)	24	24	0.893
ABD.GIRTH	20	20	0.054

Table (4): Post-application Data

Post-application/Mean	CPAP	SNIPPV	P VALUE
RESP. RATE	49	49	0.556
PCO2	43	43	0.810
FIO2(HRs*)	25	23.8	0.621
ABD.GIRTH	21	21	0.810

Abbreviations

* M: male, F: female, MOD: mode of delivery, ND: normal delivery, CS: caesarian section, PIE: pulmonary interstitial emphysema, IVH: Intraventricular hemorrhage, PVL: Periventricular leukomalacia, CLD: Chronic lung disease, PDA: Patent ductus arteriosus, ROP: retinopathy of prematurity, NEC: necrotizing enter colitis.

Discussion

In this study we did not interfere with the primary physician treatment and decision regarding when to use the CPAP or SNIPPV or to extubate from mechanical ventilation nor what medication decided to be given to the baby (i.e; surfactant, caffeine) or whether the baby given antenatal steroid or not, despite of that the cases of SNIPPV use were given surfactant by primary physician (table (1)) and nearly same number of cases antenatal steroid were given to their mothers, more cases were seen to fail this mode of support which means that this new mode (SNIPPV)was not superior or better

than the old mode of nasal support(CPAP) despite a meta analysis(AG De Paoli , PG Davis B Lemyre 2007 and Barrington KJ, Bull D, Finer NN1999)concluded that the SNIPPV is an effective method of augmenting the beneficial effects of NCPAP in preterm infants in the postextubation period but recommend a Further research delineate the role of NIPPV in the management of apnoea of prematurity[2,4].

Failure of extubation from mechanical ventilation was not fond to significantly different in our study despite that some studies showed a reduction in it is incidence with Non-invasive positive pressure ventilation (SNIPPV) such as (A Hutchison, S Bignall 2007) who present an increases in successful extubation by ~30%.

Conclusion

in regard of short According to the data in this study, there was no significant difference (Death,pneumothorax,gastric trauma and feeding intolerance) and long term (chronic lung disease,periverticular leucomalacia and retinopathy of prematurity)outcome between the CPAP with back up rate and CPAP without back up rate .

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