International Journal of Contemporary Pediatrics
Mir NY et al. Int J Contemp Pediatr. 2023 Mar;10(3):353-356
http://www.ijpediatrics.com
pISSN 2349-3283 | eISSN 2349-3291

DOI: https://dx.doi.org/10.18203/2349-3291.ijcp20230434

Original Research Article

Incidence of nasal trauma in nasal continuous positive airway pressure versus heated humidified high flow nasal cannula in neonates, our experience in Government Medical College Srinagar

Naseer Yousuf Mir*, Mohammad Imran Malik

Department of Paediatrics, Government Medical College, Srinagar, Jammu and Kashmir, India

Received: 17 January 2023
Revised: 10 February 2023
Accepted: 14 February 2023

***Correspondence:**
Dr. Naseer Yousuf Mir,
E-mail: mirnasirgmc@gmail.com

ABSTRACT

Background: The nCPAP (nasal continuous positive airway pressure) is noninvasive mode of ventilation that decreases the need for mechanical ventilation in neonates. The newer device heated humidified high flow nasal cannula (HHHFNC) delivers heated (to body temperature, 37 °C) and humidified (near 100% relative humidity) gas at flow rates of more than 1 liter/min through small bi-nasal prongs, that is more physiological.
Methods: This was a retrospective study conducted in neonatal intensive care unit. The eligible neonates who were put on HHHFNC or nCPAP depending upon the availability of any of these devices at the time of admission. The details regarding complications were recorded from the admission files of these patients from medical record section of the hospital.
Results: There was no statistically significant difference in complications like shock, NEC, pulmonary air leak, apnea, PDA, ROP, IVH or PVL for nCPAP or HHHFNC. However, nasal trauma was present in 18 (18%) patients in nCPAP group but in no patient in HHHFNC.
Conclusions: There is no significant differences in complication in nCPAP vs HHHFNC except nasal trauma which is more common in nCPAP.

Keywords: Nasal trauma, Neonates, HHHFNC

INTRODUCTION

The non-invasive ventilation can be given through various modes which includes nCPAP, NIPPV (nasal intermittent positive pressure ventilation) and HHHFNC.

nCPAP

It is a form of noninvasive ventilation that decreases the need for mechanical ventilation and decreases the combined outcome of death or pulmonary sequalae. However, it is associated with side effects of nasal trauma, air leak syndromes like pneumothorax, and shock.

HHHFNC

Humidified high flow nasal cannula has been recently introduced into the NICU setting as a potential alternative to nCPAP. Randomized controlled trials suggest that this newer modality may be effective alternative to and may offer some advantages over nCPAP. The commonly used term “high flow nasal cannula” is simplified, because in clinical practice, much more than flow distinguishes HHHFNC from low flow nasal cannula (LFNC) devices. LFNCs are primarily used to deliver oxygen to infants with chronic lung disease (BPD) at flow rates less than 1 liter/minute. Higher flows are reserved for older infants

and children because of concerns about airway desiccation, mucosal injury, and airway obstruction.[1-3]

The term HHHFNC specifically refers to the delivery of blended, heated and humidified oxygen. This approximates the physiological conditioning that is performed by the upper airway during spontaneous breathing in ambient air and maintains a healthy environment for the nasal mucosa.

The key feature of HHHFNC is preconditioning of the inspired gas. Because it normally takes metabolic energy of the body to warm and humidify the air we breathe, HHHFNC has the advantage of reducing resting energy expenditure.[4]

HHHFNC delivers heated (to body temperature, 37°C) and humidified (near 100% relative humidity) gas at flow rates of more than 1 liter/min through small bi-nasal prongs.[5] The major drawback of HHHFNC was that the positive airway pressure generated by it was neither measurable nor regulated warranting its use in neonates with caution.[6-9]

Objective

The aim of the study was to compare complications of the two modalities.

METHODS

This was a retrospective study conducted in neonatal intensive care unit of department of pediatrics GMC Srinagar, a tertiary care hospital in Northern India, from June 2020 to June 2022 after taking the ethical clearance from Institutional Ethical Committee. A total of 150 neonates who required noninvasive ventilation in the form of nCPAP or HHHFNC at admission were enrolled. The eligible neonates who required HHHFNC or nCPAP depending upon the availability of any of these devices at that particular time. The details regarding complications were recorded from the admission files of these patients from medical record section of the hospital.

Inclusion criteria

Neonates who presented with respiratory distress required noninvasive ventilation in the form of nCPAP or HHHNC at admission were included.

Exclusion criteria

Severe congenital malformations including congenital diaphragmatic hernia, tracheoesophageal fistula, cleft lip and palate, pulmonary hypoplasia and patients who were very sick at admission and put on mechanical ventilator were excluded.

Statistical analysis

All the collected data was recorded in Microsoft Excel and analyzed using SPSS v23. Categorical variables were described as frequencies and percentages. Discrete variables were described in terms of median and interquartile range. Continuous variables were summarized as mean and standard deviation and finally, the appropriate statistical tests were applied for data analysis. Statistical significance was set at $p<0.05$.

RESULTS

A total of 150 neonates who fulfilled criteria were enrolled for the study. Out of 150, 100 neonates received nCPAP and 50 neonates received HHHFNC. Males predominated females in both the studied groups. There were 51 (51%) males in nCPAP group and 27 (54%) males in HHHFNC group as compared to 49 (49%) and 23 (46%) females in nCPAP and HHHFNC groups respectively. NEC (necrotizing enterocolitis) was the most common complication followed by shock in nCPAP group while as shock was the most common complication in HHHFNC group.

Table 1: Comparison of complications in two groups.

Complications	CPAP (n=100)		HHHFNC (n=50)		P value
	Number	Percentage	Number	Percentage	
PDA	10	10	3	6	0.545
Pneumothorax	4	4	3	6	0.686
IVH	3	3	0	0	0.551
PVL	0	0	0	0	-
ROP	8	8	3	6	0.752
NEC	15	15	6	12	0.804
Apnea	2	2	1	2	1.000
Shock	14	14	11	22	0.215

PDA=patent ductus arteriosus; IVH=intraventricular hemorrhage; PVL=periventricular leukomalacia; ROP=retinopathy of prematurity; NEC=necrotizing enterocolitis.

Table 2: Comparison of columellar necrosis in two groups.

Columellar necrosis	nCPAP		HHHFNC		P value
	Number	Percentage	Number	Percentage	
Yes	18	18	0	0	0.001*
No	82	82	50	100	
Total	100	100	50	100	

*Statistically significant difference (p<0.05)

There was no statistically significant difference in two groups in complications like shock, NEC, pulmonary air leak, apnea, PDA (patent ductus arteriosus), ROP (retinopathy of prematurity), IVH (intraventricular hemorrhage) or PVL (periventricular leukomalacia) as shown in Table 1.

Columellar necrosis was present in 18 (18%) patients in nCPAP group but no patient in HHHFNC group developed columellar necrosis. This result was statistically significant with p value of 0.001 as shown in Table 2.

DISCUSSION

Over the past decade, HHHFNC use has become widespread across academic and nonacademic NICUs in the United States, as well as globally.[10] The introduction of HHHFNC into clinical practice has not been accompanied by apparent changes in neonatal outcome, but this has not been systematically studied in a randomized controlled approach. Early retrospective and observational studies suggested that HHHFNC can be applied safely and effectively for noninvasive respiratory management of neonates with respiratory dysfunction.[11-13]

In our study, NEC was the most common complication in nCPAP group, followed by shock. Shock was the most common complication in HHHFNC group. However, there was no statistically significant difference between the groups in the complications like pneumothorax, NEC, shock, PDA, ROP, apnea, PVL. Columellar necrosis was present in 18 (18%) in neonates managed with nCPAP but none of the patients put on HHHFNC had this complication in our study. This difference was statistically significant. However, Hegde et al in their study found that moderate to severe nasal trauma occurred only in 11% patients of HHHFNC group as compared to 41% patients of CPAP group.[14]

This study involved both term and preterm neonates. However, underlying disease was not taken into consideration.

CONCLUSION

There was no statistically significant difference between the two in complications like pneumothorax, NEC, shock, PDA, ROP, apnea, PVL. However, HHHFNC causes significantly less nasal trauma than nCPAP.

ACKNOWLEDGEMENTS

We thank our seniors in the department for providing their support especially incharge consultant NICU Dr. Umer Amin.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Kopelman AE. Airway obstruction on two extremely low birth weight infants treated with oxygen cannulas. J Perinatol. 2003;23(2):164-5.
2. Kopelman AE, Holbert D. Use of oxygen cannulas in extremely low birth weight infants is associated with muconasal trauma and bleeding, and possibly with coagulase-negative staphylococcal sepsis. J Perinatol. 2003;23(2):94-7.
3. Woodhead DD, Lambert DK, Clark JM, Christensen RD. Comparing two methods of delivering high flow gas therapy by nasal cannula following endotracheal extubation: a prospective, randomized, masked, crossover trial. J Perinatol. 2006;26(8):481-5.
4. Dysart K, Miller TL, Wolfson MR, Shaffer TH. Research in high flow therapy: mechanisms of action. Respir Med. 2009;103(10):1400-5.
5. Wilkinson D, Andersen C, O'Donnell CP, DePaoli AG, Manley BJ. High flow nasal cannula for respiratory support in preterm infants. Cochrane Database Syst Rev. 2016;2:006405.
6. Locke RG, Wolfson MR, Shaffer TH, Rubenstein SD, Greenspan JS. Inadvertent administration of positive end-distending pressure during nasal cannula flow. Pediatrics. 1993;91(1):135-8.
7. Sreenan C, Lemke RP, Mason A, Osiovich H. High-flow nasal cannulae in the management of apnea of prematurity: a comparison with conventional nasal continuous positive airway pressure. Pediatrics 2001;107(5):1081-3.
8. Chang GY, Cox CC, Shaffer TH. Nasal cannula, CPAP and vapotherm: effect of flow on temperature, humidity, pressure and resistance. Pediatr Acad Soc. 2005;57:1231.

9. Frey B, Shann F. Oxygen administration in infants. Arch Dis Child Fetal Neonatal Ed. 2003;88(2):84-8.
10. Ojha S, Gridley E, Dorling J. Use of heated humidified high-flow nasal cannula oxygen in neonates: a UK wide survey. Acta Paediatr. 2013;102(3):249-53.
11. Holleman-Duray D, Kaupie D, Weiss MG. Heated humidified high-flow nasal cannula: use and a neonatal early extubation protocol. J Perinatol. 2007;27(12):776-81.
12. Shoemaker MT, Pierce MR, Yoder BA, DiGeronimo RJ. High flow nasal cannula versus nasal CPAP for neonatal respiratory disease: a retrospective study. J Perinatol 2007;27:85-91.
13. Miller SM, Dowd SA. High-flow nasal cannula and extubation success in the premature infant: a comparison of two modalities. J Perinatol. 2010;30(12):805-8.
14. Hegde D, Mondkar J, Panchal H, Manerkar S, Jasani B, Kabra N. Heated humidified high flow nasal cannula versus nasal continuous positive airway pressure as primary mode of respiratory support for respiratory distress in preterm infants. Indian Pediatr 2016;53:129-33.

Cite this article as: Mir NY, Malik MI. Incidence of nasal trauma in nasal continuous positive airway pressure versus heated humidified high flow nasal cannula in neonates, our experience in Government Medical College Srinagar. Int J Contemp Pediatr 2023;10:353-6.