

Original Research Article

Effect of hydrocolloid dressing on nasal injury among preterm neonates on nasal continuous positive airway pressure: a randomized controlled trial

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ABSTRACT

Background: Respiratory distress in preterm neonates is a common cause of neonatal intensive care unit (NICU) admissions. Nasal continuous positive airway pressure (nCPAP) is widely used in the management of respiratory distress. Preterm neonates are at high risk for nasal injury during nCPAP. The present study was aimed to assess the effect of hydrocolloid dressing on nasal injury among preterm neonates on nCPAP.

Methods: A randomized controlled trial was carried out among 78 preterm neonates in a NICU of a tertiary care centre. Simple random sampling technique was used to enroll the preterm neonates who met the inclusion criteria. Data pertaining to demographic clinical characteristics were collected from medical record and the skin condition of the nares was assessed daily by observation. Data were analysed using SPSS software version 22. To analyze the data descriptive statistics including frequency, percentage and inferential statistics including chi-square test were utilized.

Results: Though the incidence of nasal injury in experimental group was lesser than control group (12.8% vs 23% respectively) it was not statistically significant $p=0.23$. There was a significant association between the level of nasal injury and the duration of nCPAP ($p=0.04$).

Conclusions: Prophylactic use of hydrocolloid dressing during nCPAP reduces nasal injury in preterm neonates.

Keywords: Hydrocolloid dressing, Nasal injury, Preterm

INTRODUCTION

In preterm neonates' respiratory distress is one of the most leading causes of NICU admissions.¹ nCPAP is a medical device that provides a flow of blended air oxygen mixture through the nose, resulting in positive pressure in the airways. It is commonly used to support preterm neonates with respiratory distress syndrome.²

Bubble CPAP is the most commonly used modality for delivery of nCPAP.^{3,4} nCPAP can improve oxygenation, maintains lung volume, lower respiratory airway resistance, reduce obstructive apnea and most importantly eliminate the need for ventilator and the associated risks.^{5,6} For the neonates with either respiratory failure or

upper airway obstruction, CPAP is the most common means of providing respiratory support.^{7,8} A nasal prong is most commonly used for delivering CPAP because it is less invasive.^{9,10} Nasal trauma is a well-documented complication of non-invasive respiratory support.^{11,12}

The local pressure of nasal prongs to the nasal region is easy to cause nasal injury in the new born due to cutaneous vulnerability.¹³ The limitations of delivering nCPAP with prongs include mechanical difficulties in maintaining the nasal prongs, poor tolerance of the infant, difficulties in positioning the infant, columella injury and septal deformities.¹⁴ Movement of the prong could result in nasal injury.¹⁵ The etiology of nasal injury secondary to nCPAP is that the increased pressure around the

nostrils decreases the circulation of blood flow which impairs tissue perfusion and subsequently causes ischemic lesions.¹⁶ Nasal injury rate due to the use of nCPAP among preterm neonates ranges from 20% to 100%.¹⁷ Nasal injury is painful and sometimes cause necrosis or permanent deformity and may require surgical intervention to correct nasal deformities.¹⁸ Preserving the skin and mucosal membranes in preterm infants is important to protect against infection and to avoid discomfort and nasal deformities.

Due to immaturity, the nose of preterm infants can easily be injured, by even a short application of a nasal device.¹⁹ Nasal injury may cause pain and discomfort, necessitate change in respiratory therapy.²⁰ Several sequelae have been reported, including hyperemia, nasal snubbing, Scab formation and areas of necrosis.²¹

It is important to preserve the skin and mucus membrane of preterm neonate's nares. In consideration of hydrocolloid dressing with advantages of an easy to use and cost effective and application could reduce the incidence or severity of nasal injury this study was undertaken. The present study was aimed to assess the effect of hydrocolloid dressing on nasal injury among preterm neonates on nCPAP.

METHODS

A randomized controlled trial was conducted between November 2019 to March 2020 in a tertiary care Centre after taking necessary ethical permission from institutional Ethics Committee (JIP/IEC/2019/0018) and registered in clinical trial registry India (CTRI/2019/09/021050). In NICU, preterm neonates with the gestational age of 25-36 weeks with respiratory distress in the first 24 hours of life and required treatment with nCPAP for more than 4 hours were included in the study after getting informed consent from the parents. Preterm neonates those who were with major congenital anomalies, with nasal deformities, with nasal injury were excluded from the study.

Based on previous studies nasal injury rate of 50% in one group and a relative reduction of 60% with an alpha error 0.05 and power of 0.8,³⁹ preterm neonates have to be enrolled in each group for a total of 78. Block randomization with varying block size generated through the computer was used to randomize the participants into study groups. Allocation concealment was done by using sealed and serially numbered envelopes. Everyday preterm neonates who met the inclusion criteria were selected through simple random sampling method.

Informed consent was obtained from parents of both groups. In both the groups demographic and clinical characteristics such as gestational age, gender, birth weight, diagnosis and duration of nCPAP (in hours) were noted from the medical record. In experimental group

hydrocolloid dressing was applied around the preterm neonate's nostrils before nCPAP were connected and in control group the routine care (smearing of petroleum jelly around the nostril before nCPAP was connected) was given. Nasal injury assessment was done once daily. Nasal injury assessment was continued daily until nCPAP was removed. Nasal septum and nostrils were examined and findings were recorded as normal (no injury), mild (erythema, superficial skin erosion), moderate (full thickness skin loss) and severe (extensive skin necrosis).

Data collection instrument had two sections. The first section included data regarding demographic and clinical characteristics of preterm neonates. It comprised of gestational age, birth weight, diagnosis duration of CPAP. Second section dealt with nasal injury assessment. The content validity of the two sections of the tool was obtained from the experts of neonatology and the nursing field. Reliability was examined by Cron Bach's alpha (alpha=0.43). Confidentiality of the data, right to withdraw from the study and anonymity of the subjects were explained to the parents.

Data were analyzed using SPSS version 22. Both descriptive and inferential statistics were used for analyzing the data. Frequency and percentages were used to describe the demographic and clinical variables of the study participants. Chi-square test was used to compare the level of nasal injury between the groups.

RESULTS

In both groups both genders were equal and 52.5% of them were less than 32 weeks of gestational age. About 47.4% of the preterm neonates in this study had low birth weight and 88.4% of them had respiratory distress syndrome. Pertaining to duration of nCPAP 51.2% of neonates had more than 120 hours. There was no significant difference noted among both groups in terms of gender, gestational age, birth weight, diagnosis and duration of nCPAP (Table 1).

In experimental group 87.2% of neonates not had any nasal injury compared to 76.9% in control group. only 12.8% had mild nasal injury in experimental group compared to 17.9% in control group. Nobody in experimental group had moderate or severe nasal injury whereas in control group 5.2% had moderate nasal injury. Though there was a reduction in each level of nasal injury and the overall incidence in experimental group it was not statistically significant $p=0.23$ (Table 2).

In experimental group there was no significant association between birth gestation age, gender, birth weight and diagnosis with level of nasal injury. Only duration of nCPAP was associated with level of nasal injury $p=0.04$ (Table 3). In control group there was no significant association between level of nasal injury with demographic and clinical variables (Table 4).

Table 1: Demographic and clinical characteristics of the preterm neonates (n=78).

S. no.	Variables	Experimental group (n=39)		Control group (n=39)		P value ^a
1	Gender	N	%	n	%	0.82
	Male	20	51.3	19	48.7	
	Female	19	48.7	20	51.3	
2	Gestational age (in weeks)					0.25
	Less than 32	23	59	18	46.2	
	More than 32	16	41	21	53.8	
3	Birth weight					0.24
	Extremely low birth	6	15.4	3	7.7	
	Very low birth weight	18	46.2	14	35.9	
	Low birth weight	15	38.4	22	56.4	
4	Diagnosis					0.28
	Respiratory distress syndrome	33	84.6	36	92.3	
	Apnoea or perinatal asphyxia	6	15.4	3	7.7	
5	Duration of nCPAP (in hours)					0.1
	Less than 120	16	41	22	56.4	
	More than 120	23	59	17	43.6	

^a chi-square test**Table 2: Comparison of level of nasal injury in both groups (N=78).**

Level of nasal injury	Experimental group (n=39)		Control group (n=39)		χ^2	df	P value ^a
	(f)	(%)	(f)	(%)			
Normal	34	87.2	30	76.9	1.39	2	0.23
Mild	5	12.8	7	17.9			
Moderate	0	0	2	5.2			
Severe	0	0	0	0			

^a chi-square test**Table 3: Association of level of nasal injury with demographic and clinical variables in experimental group (n=39).**

S. no.	Variables	Level of nasal injury						
		Experimental group						
		Normal		Mild		χ^2	df	P ^a value
		N	%	N	%			
1	Gestational age (in weeks)							
	Less than 32	20	87	3	13	0.002	1	0.96
	More than 32	14	87.5	2	12.5			
2	Gender							
	Male	17	85	3	15	0.17	1	0.67
	Female	17	89.5	2	10.5			
3	Birth weight							
	Extremely low birth weight	5	83.3	1	16.7	0.13	2	0.93
	Very low birth weight	16	88.9	2	11.1			
	Low birth weight	13	86.7	2	13.3			
4	Diagnosis							
	RDS	29	87.9	4	12.1	0.09	1	0.75
	Apnoea or perinatal asphyxia	5	83.3	1	16.7			
5	Duration of nCPAP							
	Less than 120	16	100	0	0	3.99	1	0.04*
	More than 120	18	78.3	5	21.7			

*Statistically significant ^a chi-square test

Table 4: Association of level of nasal injury with demographic and clinical variables in control group (n=39).

S. no.	Variables	Level of nasal injury								χ^2	df	P ^a value
		Control group										
		Normal		Mild		Moderate						
		N	%	N	%	N	%					
1	Gestational age (in weeks)											
	Less than 32	11	61.1	5	27.8	2	11.1	5.21	2	0.07		
	More than 32	19	90.5	2	9.5	0	0					
2	Gender											
	Male	17	89.5	2	10.5	0	0	3.79	2	0.15		
	Female	13	65	5	25	2	10					
3	Birth weight											
	Extremely low birth	1	33.3	2	66.7	0	0	6.35	4	0.17		
	Very low birth weight	10	71.4	3	21.4	1	7.1					
	Low birth weight	19	86.4	2	9.1	1	4.5					
4	Diagnosis											
	RDS	29	80.6	5	13.9	2	5.6	5.26	2	0.07		
	Apnoea or perinatal	1	33.3	2	66.7	0	0					
5	Duration of nCPAP											
	Less than 120 hours	18	81.8	4	18.2	0	0	2.74	2	0.25		
	More than 120 hours	12	70.6	3	17.6	2	11.8					

^a chi-square test.

DISCUSSION

Nasal injury remaining a common problem in very preterm infants receiving non-invasive respiratory support.²²⁻²⁴ Nasal barrier dressings seem to be effective in reducing nasal injury secondary to CPAP. The application of a physical barrier has also been shown to decrease the severity of nasal injury, as it relieves excessive pressure exerted by binasal prongs. In the study authors found that use of hydrocolloid dressing lowered the incidence of nasal injury among preterm neonates on nCPAP. Xie et al also similarly noted that a nasal dressing created a better seal in the nares during CPAP delivery and there was a lower incidence of mild-moderate nasal injury in the hydrocolloid dressing group $p=0.01$.²⁵

In another trial by Gunlemez et al found that the application of silicone gel sheeting to the nares during CPAP decreased the severity and incidence of nasal injury $p<0.05$.²⁶ Badr et al used polyvinyl chloride foam septum protector (Neoseal) and noted that neoseal significantly reduced the rate of nasal injury $p=0.01$.²⁷ Collins et al compared two nasal dressings. One was a hydrocolloid material cannulaide and the other dressing was a Velcro-coated hydrocolloid material. There was no difference in mean nasal injury score.²⁸ Morris et al noted no significant differences in group with hydrocolloid dressing and control group.²⁹ Imbulana et al noted significant difference between hydrocolloid dressing group and control group $p=0.02$.³⁰ Present study showed that in experimental group there was significant association between nasal injury and duration of nCPAP. Similarly, Badr et al also reported significant association

of nasal injury with duration of cannula ($p=0.01$), birth weight ($p=0.01$) and gestational age ($p=0.001$). In control group moderate level of nasal injury was noted in preterm neonates with less than 32 weeks of gestation who had more than 120 hours of nCPAP. Ota et al also similarly noted that nasal injury developed on an average of 18 hours after the device was connected with the short period of use of 6 hours and the largest period of use as approximately 72 hours.³¹ In another trial by Do nascimento et al found that use of prongs for more than 2 days represents a risk factor for the lesions to develop.³²

Similarly, Singh et al found that more the duration of CPAP the higher the severity of trauma.³³ Similarly Fischer et al found that greater risk of nasal trauma was among neonates with gestational age of less than 32 weeks, birth weight less than 1.5 kg and those who were on nCPAP for more than 5 days.³⁴ The main constraint was that the trial could not be blinded and neonates with major congenital anomalies were excluded from the study. Hence the findings of this study should not be generalized. Before generalization of the findings further research preferably in multi centric should be undertaken. Neonatal intensive care unit nurses play a major role in prevention of injuries to preterm neonates. The findings of the study revealed that the incidence of nasal injury was lesser in hydrocolloid dressing group. This evidence-based practice can be included in the standard preterm care protocol in NICU.

CONCLUSION

Preterm neonate skin is very fragile and more prone for injury. During nCPAP the pressure exhibited by the nasal prong and also the movement of the prong could cause

nasal injury and moreover it causes severe pain and sometimes it may lead to necrosis of the skin around the nostrils and thus pave the way for the seek of another method of respiratory support. Use of hydrocolloid dressing prevents these discomforts in preterm neonates and lessens the incidence and severity of the nasal injury.

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REFERENCES

- Mathai SS, Raju U, Kanitkar M. Management of respiratory distress in the new born. *Med J Armed Forces India*. 2007;63(3):269-72.
- Amatya S, Macomber M, Bhutada A. Sudden Versus gradual pressure wean from nasal CPAP in preterm infants: a randomized controlled trial. *J Perinatol*. 2017;37:662-7.
- Pillow JJ, Hillman N, Moss TJ, Proglase G, Bold G, Beaumont C, et al. Bubble continuous positive airway pressure enhances lung volume and gas exchange in preterm lambs. *Am J Respir Crit Care Med*. 2007;176(1):63-9.
- Tapia JL, Urzua S, Bancalieri A, Meritano J, Torres G, Fabres J, et al. Randomized trial of early bubble continuous positive airway pressure for very low birth weight infants. *J Pediatr*. 2012;161(1):75-80.
- Gregory GA, Kitterman JA, Phibbs RH, Tooley WH, Hamilton WK. Treatment of the idiopathic respiratory-distress syndrome with continuous positive airway pressure. *N Engl J Med*. 1971;284(24):1333-40.
- Morley C, Davis P. Continuous positive airway pressure: current controversies. *Curr Opin Pediatr*. 2004;16(2):141-5.
- Elsobkey AF, Amer AM. Effect of educational guidelines program about nursing care of neonates receiving continuous positive airway pressure-A quasi-experimental research. *IOSR-JNHS*. 2018;7:16-26.
- Jasani B, Ismail A, Rao S, Patole S. Effectiveness and safety of nasal mask versus binasal prongs for providing continuous positive airway pressure in preterm infants-A systematic review and meta-analysis. *Pediatr Pulmonol*. 2018;53(7):987-92.
- Davis P, Davies M, Faber B. A randomised controlled trial of two methods of delivering nasal continuous positive airway pressure after extubation to infants weighing less than 1000 g: binasal (Hudson) versus single nasal prongs. *Arch Dis Child Fetal Neonatal*. 2001;85(2):82-5.
- Trevisanuto D, Grazzina N, Doglioni N, Ferrarese P, Marzari F, Zanando V. A new device for administration of continuous positive airway pressure in preterm infants: comparison with a standard nasal CPAP continuous positive airway pressure system. *Intensive Care Med*. 2005;31:859-64.
- Squires AJ, Hydman M. Prevention of nasal injuries secondary to NCPAP application in the ELBW infant. *Neonatal Netw*. 2009;28(1):13-27.
- Robertson NJ, McCarthy LS, Hamilton PA, Moss AL. Nasal deformities resulting from flow driver continuous positive airway pressure. *Arch Dis Child Fetal Neonatal*. 1996;75(3):209-12.
- Buettiker V, Hug MI, Baenziger O, Meyer C, Frey B. Advantages and disadvantages of different nasal CPAP systems in newborns. *Intensive Care Med*. 2004;30:926-30.
- Bonner KM, Mainous RO. The Nursing Care of the infant receiving bubble CPAP therapy. *Adv Neonatal Care*. 2008;8(2):78-95.
- Dibiasi RM. Nasal continuous positive airway pressure (CPAP) for the respiratory care of the newborn infant. *Respir Care* 2009;54(9):1209-1235.
- Carlidge P. The epidermal barrier. *Semin Neonatal*. 2000;5(4):273-80.
- Yong SC, Chen SJ, Boo NY. Incidence of nasal trauma associated with nasal prong versus nasal mask during continuous positive airway pressure treatment in very low birthweight infants: a Randomised controlled study. *Arch Dis Child Fetal Neonatal*. 2005;90(6):480-3.
- Li Y, Sepulveda A, Buchanan EP. Late presenting nasal deformities after nasal continuous positive airway pressure injury: 33-year experience. *J Plast Reconstr Aesth Surg*. 2015;68(3):339-43.
- Lefrak L. Infection risk reduction in the intensive care nursery: a review of patient care practices that impact the infection risk in global care of the hospitalized neonates. *J Perinat Neonatal Nurs*. 2016;30(2):139-47.
- Carlisle HR, Kamlin COF, Owen LS, Davis PG, Morley CJ. Oral continuous positive airway pressure (CPAP) following nasal injury in a preterm infant. *Arch Dis Child Fetal Neonatal*. 2010;95(2):142-3.
- Newnam KM, McGrath JM, Estes T, Jallon Salyer J, Bass WT. An integrative review of skin breakdown in the preterm infant associated with nasal continuous positive airway pressure. *J Obstet Gynecol Neonatal Nurs*. 2013;42(5):508-16.
- McCoskey L. Nursing Care Guidelines for prevention of nasal breakdown in neonates receiving nasal CPAP. *Adv Neonatal Care*. 2008;8(2):116-24.
- Wilkinson D, Andersen C, O'Donnell CP, De Paoli AG, Manley BJ. High flow nasal cannula for respiratory support in preterm infants. *Cochrane Database Syst Rev*. 2016;22(2):6405.
- DeMauro SB, Millar D, Kirpalani H. Noninvasive respiratory support for neonates. *Curr Opin Pediatr*. 2014;26(2):157-62.
- Xie LH. Hydrocolloid dressing in preventing nasal trauma secondary to nasal continuous positive airway pressure in preterm infants. *World J Emerg Med*. 2014;5(3):218-22.

26. Gunlemez A, Isken T, Gokalp AS, Turker G, Arisoy EA. Effect of silicone gel sheeting in nasal injury associated with nasal CPAP in preterm infants. *Indian Pediatr*. 2010;47(3):265-7.
27. Badr LK, Zeineddine MH, Abbass H, Charafeddine L. Neoseal to prevent nasal injury in preterm infants receiving oxygen therapy. *Neonatal Netw*. 2016;35(4):228-33.
28. Collins CL, Barfield C, Horne RS, Davis PG. A comparison of nasal trauma in preterm infants extubated to either heated humidified high-flow nasal cannulae or nasal continuous positive airway pressure. *Eur J Pediatr*. 2014;173(2):181-6.
29. Morris DL, Behr JH, Smith SL. Hydrocolloid to prevent breakdown of nares in preterm infants. *MCN Am J Matern Child Nurs*. 2015;40(1):39-43.
30. Imbulana D, Louise S, Jennifer A. A randomized controlled trial of a barrier dressing to reduce nasal injury in preterm infants receiving binasal non-invasive respiratory support. *J Pediatr*. 2018;201(10):34-9.
31. Ota TN, Davidson J, Guinsburg R. Early nasal injury resulting from the use of nasal prongs in preterm infants with very low birth weight: a pilot study. *Rev Bras Ter Inten*. 2013;25(3):245-50.
32. Dascimento RM, Ferreira AL, Coutinho AC, Santo S. The frequency of nasal injury in newborns due to the use of continuous positive airway pressure with prongs. *Rev Lat Am Enfermagem*. 2009;17(4):489-94.
33. Singh J, Bhardwar V, Chirla DK. To compare the efficacy and complication of nasal prongs vs nasal mask CPAP in neonates. *Int J Med and Dent Sci*. 2017;6(1):1392-7.
34. Fischer C, Bertelle V, Hohlfeld J, Forcada-Guex M, Stadelmann Diaw C. Nasal trauma due to continuous positive airway pressure in neonates. *Arch Dis Child Fetal Neonatal*. 2010;95(6):447-51.

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