IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 20, Issue 1 Ser.16 (January. 2021), PP 17-20
www.iosrjournals.org

Analysis and Follow-Up of Tidal and Pulmonary Function after Neonatal RDS Treatment and Related Influencing Factors

Anisur Rahman[1], Dr.Chen Xiao[2],Israt Jahan[3],Md.Salekin Akram[4]
[1]*Department of Pediatrics & Neonatology, The affiliated hospital of Yangzhou University/Medical College of Yangzhou University, Yangzhou 225001, China.*
[2] *Address correspondence to: Dr.Chen Xiao, Department of Pediatrics & Neonatology/The affiliated hospital of Yangzhou University,45 Taizhou Road, Guangling District,Yangzhou 225001, China.*
[3]*Gynecology & Obstetrics, Islami bank medical college and hospital/Bangladesh.*
[4]*Medicine, Dr.Sirajul islam medical college/Bangladesh.*

Abstract:
Objective: *To observe the clinical characteristics and assessment of lung function condition in survivors of RDS in infants at acute and chronic phase by using surfactant treatment and ventilation methods ,in order to know risk factors affecting pulmonary function of RDS infant's prognosis and lung squeals.*
Methods: *From 2018 and 2019, RDS patients were diagnosed in the affiliated hospital of Yangzhou university (n=68) whereas total of 36 cases did not meet the observation criteria or were lost to follow-up and (n=32) Patients has been done their lung function. Patients were divided into 2 groups. Pulmonary dysfunction group (n=17), Normal lung function (n=15. The data of 32 NRDS cases were retrospectively analyzed to analyze the influencing factors of abnormal pulmonary function.*
Results: *The results suggest that abnormal lung function is related to ventilation time and oxygen exposure time, and has no obvious relationship with other factors.*
At acute phase，RDS infants had low oxygen exposure and noninvasive ventilation time ($p<0.05$)，the other parameters Gander, gestational age, weight, hormones used by prenatal mothers, combined with pneumonia, PS use, blood gas changes, birth patterns, length of hospital stay, had no significantly difference ($p>0.05$).
Conclusion: *Correlation between oxygen exposure time and mechanical ventilation time in patients with NRDS and late pulmonary dysfunction.*
Key words*: Newborn baby, Respiratory distress syndrome (RDS), Infants Lung function tests, Prognosis Follow-up studies.*

Date of Submission: 15-01-2021 Date of Acceptance: 30-01-2021

I. Introduction

NRDS is common in preterm infants with incomplete lung development; however, it also occurs with a relatively high frequency (5%- 10%) in term infants.[1] Respiratory Distress Syndrome (RDS) in preterm infants is due to insufficient production of surfactant.[2]

A deficiency in alveolar surfactant due to immaturity of alveolar type II epithelial cells causes respiratory distress syndrome RDS. [3]

Surfactants at birth or shortly thereafter has greatly reduced the morbidity, mortality, and costs associated with treatment of RDS in preterm infants. [4-8]

The management of RDS consists of antenatal steroids, surfactant replacement, oxygen administration, positive-pressure ventilation, and nutritional support.[9,10] Respiratory distress syndrome in preterm infants is associated with significant morbidity and mortality.[9,11]

The use of the surfactants is well established as an effective treatment for RDS.[12,13]

Use of MV during the index NICU period was determined at day 3 and day 7. [14,15] Mortality was assessed only during the index NICU period.

May be related to study time, diagnostic criteria for the disease, severity assessment, patient age and living environment And so on. In this paper, the clinical characteristics of infants with RDS were observed and analyzed to find the risk of the disease.

Studies have pointed out that positive pressure ventilation, oxygen therapy, mechanical ventilation and other treatment methods are prone to lung injury and affect lung function. At present, there is a lack of systematic research on the risk factors that affect NRDS lung function. With the development of medical technology, the fatality rate of NRDS has dropped significantly, but the number of patients with secondary lung

injury is increasing and the number of patients with long-term lung function decline is increasing, which affects the quality of life of children. For this reason, this study followed up 68 children with NRDS discharged from the hospital from 2018 to 2019 to explore the risk factor of abnormal lung function.

II. Methods And Materials:

2.1 Research object: The diagnostic criteria are in line with the NRDS diagnostic criteria of "Practical Neonatology", and the exclusion criteria: 1. There are symptoms of respiratory tract infection when tested. 2. Congenital heart disease, pulmonary dysplasia, neuromuscular disease and other congenital diseases that affect lung function, 3 have a family history of respiratory disease. 68 cases were followed up and finally 32 cases met the criteria.

2.2 General information: Sixty eight patients with RDS in neonate were studied in the affiliated hospital of Yangzhou university, whereas their gestational age 27 to 37 weeks, birth weight of ≥1000 g, and used surfactant and ventilation administration mainly whereas 32 patients checked their pulmonary function after discharged from the hospital. Multivariable regression was used to evaluate all NICU outcomes. Recorded patient data Including gender, gestational age, birth weight, Oxygen exposure time, Noninvasive ventilation time, cesarean section indication, use of PS, using corticosteroid of mother, asphyxia, Blood gas, length of stay and other infection . At the same time for the lung function test recorded tidal volume [ml/kg], tPTEF%tE [%], VPEF%VE [%], respiratory rate [1/min], ratio tI to tE.

2.3 Follow-up: All discharged NRDS children were notified by phone at 44 weeks of corrected gestational age. The neonatal follow-up clinic was followed up. No respiratory tract infection was detected in the first 4 weeks. The lung function test produced by the German company JAEGER was used to test the lung function set in the study. Test status (resolution> 0.1 mL; flow rate sensitivity> 0.5 mL / s; dead volume 2 mL). Before the test, the weight measurement is accurate to 10 g and the length measurement is accurate to 1 cm. After a temperature stabilization period of at least 30 minutes, perform a humidity and capacity calibration on all equipment before testing. Before testing, 10% chloral hydrate (0.3 ~ 0.5 mL / kg lavation or oral) was used to induce sleep. During the test, the child was placed in the supine position. During the non-rapid eye movement sleep phase, the mouth and nose were fastened with a mask. The index and middle fingers were pressed against the sides of the nose. All children were tested 5 times, and 20 regular breathing cycles were recorded each time, and the computer automatically calculated the average value. The main parameters measured are: tidal volume per kilogram of body weight (VT / kg), peak volume ratio (VPEF / VE), peak time ratio (TPEF / tE), suction frequency (R), and breathing ratio.

2.4 Statistical method: SPSS 20.0 was used for statistical analysis. Count data was used chi-square test. Measurement data for normal distribution was expressed as mean ± standard deviation ($x \pm s$). Independent sample t test was used. The median (quartile) [M (P25, P75)] indicates that a nonparametric test is applied. $P < 0.05$ was considered statistically significant.

III. Results

NCPAP ventilation time and oxygen exposure time were significantly different between the dysfunction group and the normal lung function group ($P < 0.05$), while gestational age, birth weight, use of prenatal hormones, delivery methods, asphyxia during delivery, There were no significant differences in the use of PS, PH value, combined pneumonia, and length of hospital stay between the pulmonary dysfunction group and the normal pulmonary function group ($P > 0.05$).

Table: Comparison of influencing factors of tidal and pulmonary dysfunction after neonatal RDS treatment

Project	Pulmonary dysfunction group（n=17）	Normal lung function（n=15）	χ^2/t/Z value	*P*-value
Gender（Example）				
Male	8	10	1.245	0.265
Female	9	5		
Cesarean section(EX)				
Yes	11	9	0.075	0.784
No	6	6		
Early use of PS（EX）				
Yes	6	6	0.075	0.784
No	11	9		
Use of hormones in the foot volume of 48 h before birth(EX)				
Yes	9	7	0.125	0.723
No	8	8		
Asphyxia（EX）				
Yes	6	3	0.922	0.337
	11	12		

No				
Blood gas PH ≤7.2	10	5	2.079	0.149
（EX）	7	10		
Yes				
No	11	8	0.427	0.513
Merge Pneumonia	6	7		
（EX）				
Yes				
No				
GA（week）	31.76±3.19	32.4±2.95	0.582	O.565
BW（gm）	1786.47±721.72	1938.33±627.64	0.631	0.533
Oxygen exposure time	263.47±346.42	71.67±35.01	-2.131	0.041
（h）				
MV time	96（66.50,204.00）	48（36.00,72.00）	-3.299	0.001
〔M(P25,P75)h〕				
Length of stay	28.94±20.98	25.13±20.42	-0.519	0.608

IV. Discussion

In 1971, the first article was published on the use of bubble CPAP to treat respiratory distress syndrome (RDS) in neonates. [16] CPAP did not gain widespread acceptance until the early 1980s and, with improvements in technology later in that decade, CPAP was largely replaced by mechanical ventilators as the primary mode of respiratory support for premature infants with lung disease. [17]

Mechanical ventilation is initially used widely after administration of surfactant. It should be noted that respiratory support can be made only with nCPAP after administration of surfactant in babies with spontaneous respiration [18-20].

It has been demonstrated that RDS babies complicated with severe birth asphyxia develop profound lung disease, including hemorrhagic lung edema and the persistence of fetal circulation [21]

Babies with an optimal response to surfactant had a lower mortality rate and presented fewer chronic lung disease cases than those with a poor response. The mortality was strongly associated with poor response to surfactant, decreasing birth weight and acidosis before surfactant therapy. Many of these factors are related to perinatal events including an inter-current episode of hypoxia during the first hours of life, and not only modify the course of 'pure' RDS, but also compromise other complications of prematurity.

Drawing on the results of this study and others, it would appear that the current tasks before us are not only to optimize surfactant therapy but also to minimize several variables that affect the surfactant treatment response, such as birth asphyxia and congenital infection, and other complications of preterm births as far as possible.

Recently, it has been emphasized that preterm infants should be managed without MV where possible and if ventilation is needed to minimize the time an endotracheal tube is used. Use of non-invasive respiratory support has increased with an expansion of methods to achieve it, but there is often a paucity of evidence to determine which method is most effective. CPAP has been used for over 40 years with early trials showing that it improves oxygenation, regulates breathing and is effective at reducing reintubation following extubation [22]. CPAP is now recommended as the optimal first mode of respiratory support although other modes of non-invasive support from birth are being tested in clinical trials [23].

Despite best intentions to maximize non-invasive support, many small infants will initially require MV, and about half of those less than 28 weeks' gestation will fail their first attempt at extubation with these having higher mortality and morbidity [24]. The aim of MV is to provide "acceptable" blood gases whilst avoiding lung injury which is typically caused by too high or too low pressure delivery. The principle of MV is to inflate atelectasis lung, optimizing lung volume for even distribution of tidal volumes at pressures set to prevent atelectasis and over-distension. Over-inflation increases risk of air leaks such as pneumothorax and pulmonary interstitial emphysema. Ventilation at too low a pressure risks areas of lung becoming repeatedly atelectasis during expiration, which can generate inflammation.

The results of the study of NADS patients with abnormal lung function after various treatment options, the oxygen exposure time, and the length of ventilation time are statistically significant and the reasons are analyzed.

These data, together with a comprehensive identification of variables influencing the clinical response to surfactant therapy, oxygen exposure time and MV time and outcome, will provide useful information for generating hypotheses for prospective studies. Data on these outcomes will continue to be sought.

V. Conclusion

In this cohort study, non-invasive methods, can provide useful information about the respiratory function also in preschoolers and offer the opportunity to further follow-up and monitor these children in the long-term. This is particularly important since lung function tracks throughout life, at risk of developing chronic

obstructive pulmonary disease in adulthood.in our experiment, Infants had caesarean birth， asphyxia, pneumonia history may be susceptible populations develop RDS．Concern about aggressive diagnosis and intensive treatment are essential to good outcomes in RDS．Residual obstructive defect remain common after RDS．Rehabilitation is useful to speed mobility and muscle strength．

References:

[1]. Reuter S, Moser C, Baack M. Respiratory distress in the newborn. Pediatr Rev. 2014;35(10):417-428. doi:10.1542/pir.35-10- 417.
[2]. Sardesai S, Biniwale M, Wertheimer F, et al. Evolution of surfactant therapy for respiratory distress syndrome: past, present, and future. Pediatr Res. 2017;81(1–2):240– 248.
[3]. Pattle, R.E., 1955. Properties, function and origin of Ž. the alveolar lining layer.Nat. Lond. 175,11251126.
[4]. Sardesai S, Biniwale M, Wertheimer F, et al. Evolution of surfactant therapy for respiratory distress syndrome: past, present, and future. Pediatr Res. 2017;81(1–2):240– 248.
[5]. Engle WA; American Academy of Pediatrics Committee on Fetus and Newborn. Surfactant-replacement therapy for respiratory distress in the preterm and term neonate. Pediatrics. 2008;121(2):419–432.
[6]. Polin RA, Carlo WA; Committee on Fetus and Newborn; American Academy of Pediatrics. Surfactant replacement therapy for preterm and term neonates with respiratory distress. Pediatrics. 2014;133(1):156–163.
[7]. Halliday HL. Surfactants: past, present and future. Perinatology 2008;28(suppl 1):S47–S56.
[8]. Ramanathan R, Bhatia JJ, Sekar K, Ernst FR. Mortality in preterm infants with respiratory distress syndrome treated with poractant alfa, calfactant or beractant: a retrospective study. J Perinatol. 2013;33(2):119–125.
[9]. Respiratory distress syndrome. http://emedicine.medscape.com/article/976034. Accessed February 19, 2019.
[10]. Martin, R. Prevention and treatment of respiratory distress syndrome in preterm infants. In: Post T, ed. UpToDate. Waltham, MA: UpToDate; September 13, 2017. https:// www.uptodate.com/contents/prevention-and-treatmentof-respiratory-distress-syndrome-in-preterm-infants. Accessed February 19, 2019.
[11]. Preterm Birth: Causes, Consequences, and Prevention. Institute of Medicine (US) Committee on Understanding Premature Birth and Assuring Healthy Outcomes; Behrman RE, Butler AS, editors. Preterm Birth: Causes, Consequences, and Prevention. Washington (DC): National Academies Press (US); 2007. B, Prematurity at Birth: Determinants, Consequences, and Geographic Variation. https://www.ncbi.nlm.nih.gov/books/NBK11386/ Accessed October 21, 2017.
[12]. Sardesai S, Biniwale M, Wertheimer F, et al. Evolution of surfactant therapy for respiratory distress syndrome: past, present, and future. Pediatr Res. 2017;81(1–2):240– 248.
[13]. 17. Schwartz RM, Luby AM, Scanlon JW, Kellogg RJ. Effect of surfactant on morbidity, mortality, and resource use in newborn infants weighing 500 to 1500 g. N Engl J Med. 1994;330(21):1476–1480.
[14]. Laughon MM, Langer JC, Bose CL, et al. Prediction of bronchopulmonary dysplasia by postnatal age in extremely premature infants. Am J Respir Crit Care Med. 2011;183(12):1715–1722.
[15]. Berger J, Mehta P, Bucholz E, et al. Impact of early extubation and reintubation on the incidence of bronchopulmonary dysplasia in neonates. Am J Perinatol. 2014;31(12):1063–1072.
[16]. Gregory GA, Kitterman JA, Phibbs RH, Tooley WH, Hamilton WK. Treatment of idiopatic respiratory distress syndrome with continuous positive airway pressure. N Engl J Med. 1971;284(24):1333–1339.
[17]. Courtney SE, Barrington KJ. Continuous positive airway pressure and noninvasive ventilation. Clin Perinatol. 2007;34(1):73–92.
[18]. Verder H, Robertson B, Greisen G, et al. Surfactant therapy and nasal continuous positive airway pressure for newborns with respiratory distress syndrome. N Engl J Med 1994; 331: 1051-5. [CrossRef]
[19]. Alba J, Agarwal R, Hegyl T, Hiatt M. Efficacy of surfactant therapy in infants managed with CPAP. Pediatr Pulmonol 1995; 20: 172-6.
[20]. Jonsson B, Katz-Salamon M, Faxelius G, Broberger U, Lagercrantz H. Neonatal care of very-low-birthweight infants in special-care units and neonatal intensive-care units in Stockholm: early nasal continuous positive airway pressure versus mechanical ventilation: gain and losses. Acta Paediatr Suppl 1997; 419: 4-10.
[21]. KamperJ,RingstedC.Earlytreatmentofidiopathicrespiratory distress syndrome using binasal continuous positiveairwaypressure.ActaPaediatrScand.1990;79:581– 586.
[22]. Davis PG, Henderson-Smart DJ. Nasal continuous positive airways pressure immediately after extubation for preventing morbidity in preterm infants. Cochrane Database Syst Rev. 2003;2((2)):CD000143.
[23]. Subramaniam P, Ho JJ, Davis PG. Prophylactic nasal continuous positive airway pressure for preventing morbidity and mortality in very preterm infants. Cochrane Database Syst Rev. 2016 Jun;6((6)):CD001243.
[24]. Chawla S, Natarajan G, Shankaran S, Carper B, Brion LP, Keszler M, et al. Eunice Kennedy Shriver National Institute of Child Health and Human Development Neonatal Research Network Eunice Kennedy Shriver National Institute of Child Health and Human Development Neonatal Research Network: markers of successful extubation in extremely preterm infants, and morbidity after failed extubation. J Pediatr. 2017 Oct;189:113–119.e2.

Anisur Rahman, et. al. "Analysis and Follow-Up of Tidal and Pulmonary Function after Neonatal RDS Treatment and Related Influencing Factors." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 20(01), 2021, pp. 17-20.