International Journal of Contemporary Pediatrics
Kumar C et al. Int J Contemp Pediatr. 2022 May;9(5):512-514
http://www.ijpediatrics.com
pISSN 2349-3283 | eISSN 2349-3291

DOI: https://dx.doi.org/10.18203/2349-3291.ijcp20221083

Case Report

Neonatal acute respiratory distress syndrome: a less explored diagnosis

Chanchal Kumar*, Rajeev Pothala, Sushma Poornima Bathina, Deepika Dodda, Eswara S. Rao

Department of Neonatology, Ankura Hospital for Women and Children, Hyderabad, Telangana, India

Received: 25 March 2022
Revised: 13 April 2022
Accepted: 20 April 2022

***Correspondence:**
Dr. Chanchal Kumar,
E-mail: drchanchalkumarkem@gmail.com

ABSTRACT

Neonatal acute respiratory distress syndrome (ARDS) is less explored and unclassified entity although the neonatologists are aware of the existence of this condition. Extensive lung inflammation and surfactant catabolism leading to lung dysfunction are the pathophysiological characteristics of neonatal ARDS which is like in older children and adults. Montreux definition should be used for neonates from birth until 4 weeks or 44 weeks post-menstrual age if born before 40-weeks' gestation. Trials on surfactant for ARDS in neonates have been performed well before the NARDS definitions and yielded conflicting results. Authors reported a preterm baby identified with neonatal ARDS secondary to polymicrobial sepsis (*Candida parasilosis* and Coagulase negative *Staphylococcus*) after meeting the Montreux definition for neonatal ARDS. He was initially treated with conventional ventilation and was successfully treated with high frequency ventilation and surfactant administration. Well-designed preclinical and explanatory clinical studies to investigate the use of surfactant for neonatal ARDS are needed.

Keywords: Neonate, Acute respiratory distress syndrome, Surfactant

INTRODUCTION

ARDS exists in neonates and might occur independently of gestational age, a hypothesis which is supported by similar biological and pathophysiological features of ARDS.[1] Extensive lung inflammation and surfactant catabolism leading to lung dysfunction are the pathophysiological characteristics of neonatal ARDS which is like in older children and adults.[2] The Montreux definition for neonatal ARDS closely resembles the definition of ARDS in patients of other ages, but the peculiarities of newborn infants and the characteristics of neonatal intensive care are also considered.[3] Several risk factors including infection, pneumonia, aspiration of meconium/blood, pulmonary hemorrhage and perinatal asphyxia are proposed for neonatal ARDS.[3] Given the accumulating knowledge on ARDS biology, it is likely that surfactant therapies might be beneficial for neonatal ARDS. Moreover, there is wide room for improving these therapies with the addition of drugs enhancing surfactant activity and/or reducing lung inflammation. Trials on surfactant for ARDS in neonates have been performed well before the NARDS definitions and yielded conflicting results. This is mainly due to heterogeneity in study design reflecting historic lack of pathobiology knowledge. Ten trials investigated the use of surfactant for ARDS in neonates. There were improvements in oxygenation (7 trials) and mortality (one trial) improved. Trials were heterogeneous for patients' characteristics, surfactant type and administration strategy.[4]

Here, authors report a preterm baby identified with neonatal ARDS secondary to polymicrobial sepsis (*C. parasilosis* and Coagulase negative *Staphylococcus*) after meeting the Montreux definition for neonatal ARDS. He was initially treated with conventional ventilation and was successfully treated with high frequency ventilation and surfactant administration.

CASE REPORT

A singleton preterm male neonate born at 26 weeks to a gravida 3 mother with birthweight of 709 g was referred to our hospital at 12 hours of life. Baby received 3 doses of surfactant for severe respiratory distress syndrome (RDS) and was managed with volume target ventilation. He was also managed with appropriate antibiotics, parenteral nutrition, and other supportive measures. Echocardiography was not suggestive of patent ductus arteriosus and initial sepsis screen was negative. He showed improvement both clinically and radiologically and the requirement of mean airway pressure (MAP) and fractional inspired oxygen (FiO_2) were coming down (Figure 1). He was tolerating incremental enteral feeds and was otherwise recovering. However, on day 7 of life, he started to have increased MAP and FiO_2 requirement. Echocardiography was normal and chest X-ray was suggestive of new onset diffuse inhomogeneous opacities in bilateral lung fields (Figure 2). Sepsis screen was positive and blood culture showed growth of *C. parasilosis* and Coagulase negative *Staphylococcus*. Blood gas analysis showed severe metabolic acidosis with hypoxemia and oxygenation index was 18. But he remained hemodynamically stable and there was no requirement of vasoactive medications. He met the Montreux definition of neonatal ARDS.[3] He received appropriate anti-fungal and antibiotics, two more doses of surfactant and high frequency oscillatory ventilation for next 48 hours. With improvement in clinical condition, baby was weaned off to conventional ventilation. However further weaning to non-invasive respiratory support was difficult. He received appropriate course of postnatal steroid therapy and was extubated to non-invasive respiratory support at 3 weeks of life and subsequently to room air at 9 weeks of life. He developed grade I bronchopulmonary dysplasia and was managed with appropriate fluid restriction, adequate calorie, furosemide, and bronchodilator therapy. He was discharged home at 12 weeks of postnatal life (postmenstrual age of 38 weeks) without any oxygen requirement and with adequate weight gain.

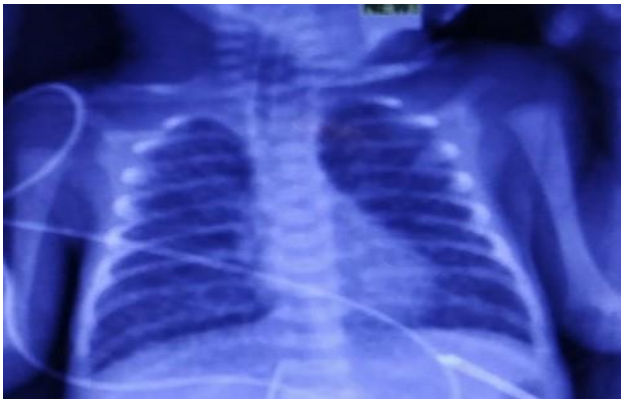

Figure 1: Roentgenogram showing well inflated lung fields before development of ARDS.

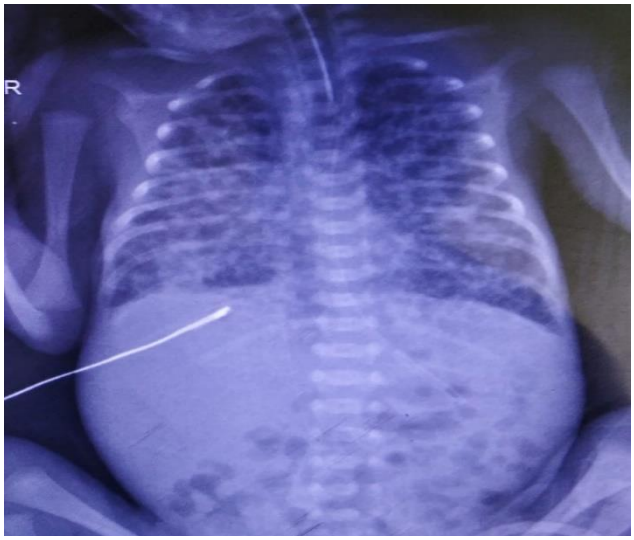

Figure 2: Roentgenogram showing diffuse inhomogeneous opacities in both lung fields.

DISCUSSION

Neonatal ARDS is less explored and unclassified entity although the neonatologists are aware of the existence of this condition. Montreux definition should be used for neonates from birth until 4 weeks or 44 weeks post-menstrual age if born before 40-weeks' gestation.[5] ARDS is a life-threatening respiratory failure characterized by lung tissue inflammation and alveolar and/or endothelial damage coupled with a complex surfactant injury.[6-8] First reported use of neonatal ARDS term was associated with perinatal asphyxia and meconium/blood aspiration.[1] ARDS is biologically characterized by qualitative or quantitative surfactant dysfunction affecting both proteins and phospholipids, and extensive lung tissue inflammation and many neonatal respiratory disorders share commonality of this biological process.[2] The histological sign of the acute phase of ARDS, occurring before the insurgence of extensive fibrosis, is diffuse alveolar damage, which is characterized by interstitial and alveolar hemorrhage or inflammatory edema, cellular infiltration, and atelectasis with possible formation of hyaline membranes. Diffuse alveolar damage is associated with meconium, milk, or water aspiration after underwater birth, sepsis and infectious pneumonia, pulmonary hemorrhage, perinatal asphyxia complicated by severe respiratory failure, and biliary pneumonia.[3] Like pediatric and adult ARDS, several risk factors including infection, pneumonia, aspiration of meconium/blood, pulmonary hemorrhage and perinatal asphyxia are proposed for neonatal ARDS. Pediatric acute lung injury consensus conference (PALICC) and Berlin definition used for pediatric ARDS are not suitable for neonates and hence was the need of Montreux definition of neonatal ARDS.[9,10] The Montreux definition excludes RDS, transient tachypnea of neonate, congenital anomalies, and congenital heart disease as a primary current respiratory condition.[3] The dissemination of Montreux definition might not only foster the neonatal

ARDS research but also facilitate the development of new therapeutic approaches to neonatal ARDS.

CONCLUSION

In conclusion, neonatal ARDS is a less explored clinical entity and widespread use of Montreux definition of neonatal ARDS will help in development of new therapeutic approaches.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

REFERENCES

1. Faix RG, Viscardi RM, DiPietro MA, Nicks JJ. Adult respiratory distress syndrome in full-term newborns. Pediatrics 1989;83:971-6.
2. Günther A, Ruppert C, Schmidt. Surfactant alteration and replacement in acute respiratory distress syndrome. Respir Res 2001;2:353-64.
3. De Luca D, van Kaam AH, Tingay DG, Courtney SE, Danhaive O, Carnielli VP et al. The Montreux definition of neonatal ARDS: biological and clinical background behind the description of a new entity. Lancet Respir Med. 2017;5(8):657-66.
4. De Luca D, Cogo P, Kneyber MC, Biban P, Semple MG, Perez-Gil J et al. Surfactant therapies for pediatric and neonatal ARDS: ESPNIC expert consensus opinion for future research steps. Critical Care. 2021;25(1):1-2.
5. De Luca D. Personalising care of acute respiratory distress syndrome according to patients' age. Lancet Respiratory Med. 2019;7(2):100-1.
6. Aggarwal NR, King LS, D'Alessio FR. Diverse macrophage populations mediate acute lung inflammation and resolution. Am J Physiol-Lung Cellular Molecular Physiol. 2014;306(8):L709-25.
7. Millar FR, Summers C, Griffiths MJ, Toshner MR, Proudfoot AG. The pulmonary endothelium in acute respiratory distress syndrome: insights and therapeutic opportunities. Thorax. 2016;71(5):462-73.
8. Raghavendran K, Willson D, Notter RH. Surfactant therapy for acute lung injury and acute respiratory distress syndrome. Critical Care Clin. 2011;27(3):525-59.
9. Khemani RG, Smith LS, Zimmerman JJ, Erickson S. Pediatric Acute Lung Injury Consensus Conference Group. Pediatric acute respiratory distress syndrome: definition, incidence, and epidemiology: proceedings from the Pediatric Acute Lung Injury Consensus Conference. Pediatr Crit Care Med. 2015;16(5-1):S23-40.
10. ARDS Definition Task Force, Ranieri VM, Rubenfeld GD, Thompson BT, Ferguson ND, Caldwell E et al. acute respiratory distress syndrome: the Berlin Definition. JAMA. 2012;307(23):2526-33.

Cite this article as: Kumar C, Pothala R, Bathina SP, Dodda D, Rao ES. Neonatal acute respiratory distress syndrome: a less explored diagnosis. Int J Contemp Pediatr 2022;9:512-4.