

17TH AMERICAN PEDIATRICS HEALTHCARE & INFECTIOUS DISEASES CONGRESS

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17th Annual World Congress on **NEONATOLOGY** June 27-28, 2018 | Vancouver, Canada



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Management of pulmonary hemorrhage in neonatal infant

Pulmonary hemorrhage (PH) is an acute, catastrophic event characterized by discharge of bloody fluid from the upper respiratory tract or the endotracheal tube. The hematocrit of the hemorrhagic fluid is often 15 to 20 percentage points below the venous hematocrit. The incidence of PH is 1 to 12 per 1,000 live births. PH occurs most commonly in the first few days after birth. Mortality rates as high as 50% have been reported. Prematurity is the factor most commonly associated with PH; other associated factors are those that predispose to perinatal asphyxia or bleeding disorders, including toxemia of pregnancy, maternal cocaine use, erythroblastosis fetalis, breech delivery, hypothermia, infection, Respiratory Distress Syndrome, administration of exogenous surfactant (in some studies) and ECMO. It is postulated that the infant suffers an asphyxial insult with resultant myocardial failure; this increases pulmonary microvascular pressure resulting in pulmonary edema. Subsequently, there is frank bleeding into the pulmonary interstitial and alveolar spaces. The typical presentation of the infant with PH is a premature infant who suddenly presents with frothy pink-tinged secretions from an ET. Over the next minutes to hours, the infant often requires increased ventilatory support and has increased work of breathing. As increasing amounts of blood are suctioned from the ET, PCO₂ starts to rise, as does the need for oxygen. If the PH continues, the infant will develop apnea, generalized pallor, become cyanotic, with concomitant bradycardia and a drop in blood pressure. Chest radiography results are nonspecific. Based on severity and timing of the PH, the chest radiograph may have fluffy opacities, focal ground-glass opacities, or appear as a complete “white out” if the PH is massive. The immediate treatment of PH should include tracheal suction to ensure that blood clots have not obstructed the ET. The FiO₂ should be increased as guided by the oxygen saturation of the infant. The standard therapy is to raise the positive end-expiratory pressure (PEEP) to 6 to 8 cm H₂O. To decrease PH, the mean airway pressure should be increased in an attempt to reverse or slow down hemorrhagic pulmonary edema. In some cases, high-frequency oscillatory ventilation may be needed to increase the mean airway pressure. Endotracheal or nebulized epinephrine has been used in the treatment of PH because of its vasoconstrictive and inotropic effects. Immediate radiography of the chest should be obtained. Once the hemorrhage has resolved, the chest radiograph will show improvement within 24 to 48 hours. Because the radiographic appearance of PH is difficult to distinguish from pneumonia, therapy often includes antibiotics until infection is ruled out. An echocardiograph should be done to rule out left to right shunting through a PDA. In this setting, surgical treatment for PDA may be safer than medical treatment because the latter may exacerbate bleeding. Phytonadione (vitamin K) should be given to correct prothrombinemia. Based on an estimate of the volume of blood lost, packed red blood cells and platelets should be given after a complete blood count, prothrombin time, activated partial thromboplastin time, D-dimers, and fibrinogen are obtained. The administration of recombinant factor VII should be considered. Activated recombinant factor VII (rFVIIa) has been successfully used to treat severe PH refractory to conventional ventilator management in very low birth weight infants. Surfactant has also been used in the treatment of PH, with significant improvement in oxygenation index and no deterioration. Hemocoagulase has been reported as a new effective treatment for PH, by converting prothrombin to thrombin and fibrinogen to fibrin. Hence, it decreases bleeding time and enhances coagulation at sites of bleeding. The mainstay of treatment includes ventilation and vigorous resuscitation of a shocked and critically ill infant.

Biography

Mohammad Monir Hossain is currently working as Professor of Neonatal Medicine, NICU & Critical Care of Paediatrics at the Bangladesh Institute of Child Health (BICH) & Dhaka Shishu (Children) Hospital. He received his PhD from the University of Dhaka for his research work on neonate receiving intensive care in 2006. After his graduation (MBBS) in 1987, he completed Doctor of Medicine in Paediatrics (MD) in 1997. He became fellow (FCPS) of Bangladesh College of Physicians & Surgeons in 1999 and Royal College of Physicians and Surgeons of Glasgow (FRCP Glasg) in 2009, Royal College of Physicians of Edinburgh (FRCP Edin) in the same year and Royal College of Paediatric & Child Health (FRCPC) in 2010. Since 2001 he has been serving as Assistant Professor, Associate Professor and Professor at Bangladesh Institute of Child Health & Dhaka Shishu (Children) Hospital. Professor Hossain has authored several publications in various journals and books. His publications reflect his research interests in critical care in neonatology. He was the Executive Editor of Bangladesh Journal of Child Health (BJCH).

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