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Chapter 1 : New modes of mechanical ventilation in the preterm newborn: evidence of benefit - CORE

The introduction of modern mechanical ventilation in neonatal medicine in the s was followed shortly thereafter by its use in premature infants with hyaline membrane disease.

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Patient triggered ventilation (PTV), also known as synchronised IPPV (SIPPV) or assist/control ventilation (A/C), is a mode of ventilation where every spontaneous inspiratory effort is assisted with a mechanical breath.

BY Deborah Phillips hrough a labyrinth of hallways with bright blue walls, where balloons and kites dot the landscape and hushed sounds guard the sleep of sick children, a thin white needle gauges the first breaths of a new life. A cadre of specialists at the University of Miami School of Medicine, from seasoned physicians to nurses and respiratory therapists, buzz through the Neonatal Intensive Care Unit, watching the preemies carefully, documenting checks and balances, attuned to every soft hiccup and labored exhale. Their research projects encompass the latest expertise and technology aimed at helping these babies, and their worried parents, breathe a little easier. Although the human respiratory system begins to develop as early as the fourth week of gestation, crucial aspects for lung function are among the finishing touches nature bestows on a baby in final preparation for its introduction to the outside world. And when a baby makes that introduction even a month too early, its immature lungs present some of the most common, yet some of the most dangerous, obstacles to its health and ultimate survival. The cause is a deficiency of surfactant, a substance essential for proper respiration that begins to be produced in the final weeks of gestation. A baby born too early, therefore, misses this crucial step and suffers the consequences as soon as the first gasps of air touch its fragile lungs. When dry air meets wet lung tissue upon inhalation, surface tension is created. Surfactant is a foamy liquid that the body produces to act against surface tension and prevent the alveoli, millions of air sacs in the lungs, from collapsing under the pressure. In the past decade, synthetic surfactant has become a lifesaver that consistently promotes normal respiration in premature infants. As soon as we give the surfactant, the oxygenation improves, the lungs start expanding, and the X ray gets much better. Bancalari and his team of neonatologists. BPD can result in chronic respiratory problems as the infant continues its development outside the womb and, in some severe cases, can hinder normal respiration for years. UM neonatologists are leading research to challenge these conventional machines that treat, yet still harm, the tiny preemie. On the other hand, we are doing something that is completely non-physiologic. In efforts to develop a safer and gentler method of respiration treatment for preemies, Dr. Bancalari and biomedical engineer Nelson Claure of the Department of Pediatrics have digitally manipulated mechanical ventilation. Previous clinical studies have shown that dispensing small volumes of gases at a high frequency reduces lung damage. These findings set the standard for the treatment Dr. Bancalari and Claure sought to administer with an enhanced ventilator. Preemies not only have immature lungs, but immature brains as well, and sometimes suddenly stop breathing. This is known as apnea, and Dr. Suguihara is closely studying the amino acid neurotransmitters that control respiration in the neonate. In healthy full-term infants, the respiratory system develops a biological mechanism to account for damage to the lung brought on by an excess of oxygen or other such compounds and also to prevent BPD. Future projects for the Division of Neonatology include research on genetic predisposition to BPD, studying slight sedation to ease the discomfort of ventilation, and recruiting specialized physician-scientists as a means to these ends. The philanthropic foundation Project: The coalition conducts studies on a variety of disorders that threaten the health of preterm infants, including projects on nutrients such as vitamin A and their effects on respiration. And that has physicians, parents, and their delicate infants, breathing a sigh of relief. Photography by John Zillioux and Donna Victor.

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Special Techniques of Respiratory Support Claure, N. & Bancalari, E., Sep 28 , Assisted Ventilation of the Neonate: An Evidence-Based Approach to Newborn Respiratory Care: Sixth Edition.