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Commentary
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Neonatology: Life on the Pendulum

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Abbreviation: RDS: Respiratory Distress Syndrome; CT: Computed Tomography; MRI: Magnetic Resonance Imaging; BPD: Bronchopulmonary Dysplasia; VILI: Ventilator-Induced Lung Injury; CPAP: Continuous Positive Airway Pressure

Commentary

The pediatric subspecialty of neonatology began in the 1960s. Many associate this with the birth and death of Patrick Bouvier Kennedy, the preterm son born to Jacqueline Kennedy, wife of President John Fitzgerald Kennedy, in August of 1963. The baby was said to have died of respiratory distress syndrome (RDS) in an era when mechanical ventilation of newborns was just starting and was not widely available. In the subsequent half century, there have been unprecedented advances in neonatal respiratory care, including the recognition of surfactant deficiency as a key element in the pathophysiology of RDS and bringing exogenous surfactant therapy to the bedside. Mechanical ventilation began as a rudimentary form of therapy, but technology brought microprocessor-based ventilation to the neonatal intensive care unit in the 1990s.

Likewise, monitoring advanced dramatically, from chest radiography to computed tomography (CT) and magnetic resonance imaging (MRI), and from intermittent blood gas monitoring to continuous pulse oximetry. Yet, for all the advancements, neonatologists still struggle with the best way to manage the extremely low birthweight baby. The goal is to safely treat the baby without creating chronic lung disease (bronchopulmonary dysplasia, BPD) from ventilator-induced lung injury (VILI). In the early decades of neonatal intensive care, neonatologists tried everything they could to avoid invasive mechanical ventilation. This included supplemental oxygen and nasal continuous positive airway pressure (CPAP), and even nasal positive pressure ventilation. Intubation and mechanical ventilation were the last resorts to treat respiratory failure.

Between 1980 and 1990, significant technologic advances including continuous monitoring, real time pulmonary graphics, and the advent of microprocessor-based mechanical ventilation with patient triggered ventilation changed the landscape and made invasive mechanical ventilation the treatment of choice in the NICU. This was further promulgated by the development of exogenous surfactant therapy and the requirement to administer it through an endotracheal tube. However, at the same time reports began to surface that noninvasive support might reduce the incidence of VILI and BPD. Two philosophies developed but it was not until the new millennium that randomized controlled trials attempted to address this, but even then, a clear- cut advantage could not be ascertained. The pendulum, however, clearly started to move back towards noninvasive ventilation, and even blended approaches, mostly to administer surfactant, came into vogue.

Novel approaches to give surfactant through vascular catheters or feeding tubes, and a hybrid approach of administering it through an endotracheal tube, then quickly extubating to CPAP have been gaining popularity, but again without scientific rigor. Now, more than a half century since the first baby was treated with mechanical ventilation, we still struggle with the best way to treat RDS and respiratory failure in the newborn. At present, the balance- largely determined by personal preference- is noninvasive support. While this may benefit numerous infants, it also creates a problem in that neonatal care providers are much less experienced in managing current mechanical ventilators, and babies requiring mechanical ventilation may again show increasing evidence of VILI and BPD.

The answer can only be found through large scale, multicenter, randomized controlled clinical trials. While these have been attempted, they have thus far not provided the penultimate evidence to guide decision making. Until they do, the pendulum is likely to continue its back-and- forth journey.

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