The self inflating resuscitation bag is unable to provide the neonate continuous positive airway pressure (CPAP). In addition, the self inflating resuscitation bag is unable to maintain end expiratory alveolar volume, which may lead to alveolar collapse and loss of alveolar recruitment. This may be overcome if a PEEP valve is incorporated into the self inflating resuscitation bag. However the self inflating resuscitation bag is often used without this PEEP valve.

The Neo-Tee is able to provide the neonate with CPAP. As simple as this sounds, Neo-Tee’s ability to provide CPAP is the tremendous benefit of the Neo-Tee over the self inflating resuscitation bag.

The only strategy that has proven to promote alveolar stability and enhance alveolar recruitment in the delivery room and the NICU is CPAP in one form or another. CPAP also prevents the loss of end expiratory alveolar volume thus maintaining alveolar stability and alveolar recruitment.

During a positive pressure breath the variation of lung volume depends on the compliance of the alveolar structures and the amount of pressure used to produce that change. The normal lung at birth does not present pure elastic behavior across the vital capacity range. Even in the normal lung at birth there are regional and postural variations in how fast or slow lung units will fill or empty along the vital capacity range.

When the lung is subjected to a pressure change, time is needed until a volume change will occur. The time necessary to inflate an alveolar structure to 63% of its volume is called a “time constant.” This concept is extremely important when trying to understand the challenges of the neonate’s pulmonary mechanics during the transition to breathing air. Time constants refer to the speed at which the alveoli will fill or empty. In the normal or near normal lung the alveolar time constants will vary based on the resistance and compliance of the lung structures. Some alveoli will fill or empty faster while others are slower to fill or empty. During transition many factors may unfavorably alter the regional time constants immediately after birth. Understanding these challenges and regional differences in time constants is essential in the delivery room and the NICU.

The successful transition from fetal circulation to pulmonary circulation depends on the neonate’s ability to achieve a stable functional residual capacity (FRC) immediately following birth. The challenge in these neonates is to achieve and maintain an adequate FRC allowing alveolar stability and optimizing alveolar recruitment. Achieving alveolar stability means that the spontaneous breath must be able to open or recruit as much of the available alveoli as possible. Maintaining alveolar stability also means that there is adequate end expiratory alveolar volume to prevent alveolar collapse and loss of alveolar recruitment.

As stated earlier, the only strategy that has proven to promote alveolar stability and enhance alveolar recruitment in the delivery room and the NICU is CPAP in one form or another. CPAP also prevents the loss of end expiratory alveolar volume, thus maintaining alveolar stability and alveolar recruitment. The Neo-Tee provides CPAP and will assist the transition process from fetal to pulmonary circulation by providing a dynamic FRC immediately following birth. The self inflating resuscitation bag does not provide a dynamic FRC.

Maintaining end-expiratory alveolar stability and alveolar volume is the function of the amount of the positive-end expiratory pressure (PEEP) or continuous positive airway pressure (CPAP) that is applied. Adding PEEP to a self inflating resuscitation bag requires the addition of a special PEEP valve to the self inflating resuscitation bag. Without this PEEP valve the end expiratory airway pressure will be allowed to return to zero after each positive pressure breath. This may cause a decrease in the FRC and loss of alveolar stability resulting in alveolar collapse and a loss of alveolar recruitment. Maintaining alveolar stability using a self inflating resuscitation bag without a PEEP valve may be impractical or impossible.

CPAP is able to achieve and maintain alveolar stability because the airway pressure never falls below the lower inflection point, preventing alveolar collapse. Keeping these alveoli inflated (dynamic FRC) and continuously participating in gas exchange is the unique secret of CPAP.

Therefore the benefit of the Neo-Tee is the ability to provide CPAP, providing a dynamic FRC and alveolar stability and optimizing alveolar recruitment which will enhance the transition from fetal to pulmonary circulation in the newborn.
Interview

In this new feature, Neonatal Intensive Care interviews clinicians and healthcare providers about the actual application of specific products and therapies. Our premiere interview is with Andrew Slezak, MEd, RRT-NPS, Neonatal Clinical Education — St Joseph’s Women’s Hospital, Tampa, FL, discussing his hospital’s use of the Neo-Tee by Mercury Medical.

Laszlo Sandor: What areas/departments could the hospital benefit from using the Neo-Tee?

Andrew Slezak: The most value comes from the use of the Neo-Tee in the delivery room. With so much unpredictability in the delivery of a newborn, it is extremely valuable to have a single device that can provide both CPAP for slow transitions and consistent ventilation in emergencies. This is especially true with our premature neonates. Having a Neo-Tee at the bedside for our NICU patients gives us the ability to respond quickly to apneas, bradycardia episodes, and other respiratory emergencies. Using a Neo-Tee allows the therapist to alter the level of support needed quickly while also providing a safer mode of resuscitation for our bedside nurses. A flow-inflating resuscitation bag needs skill and experience to operate safely while the Neo-Tee allows someone with little experience to still give consistent pressures during resuscitation (other than occluding the hole for the respiratory rate and not releasing).

LS: How many L&D and NICU beds does your facility have?

AS: A 64-bed NICU and a 22-bed L&D.

LS: How does the Neo-Tee assist clinicians in providing better patient outcomes?

AS: It reduces the risk of barotrauma during positive pressure delivery by providing consistent pressures during each breath. Due to its simplicity, it allows delivery team members to concentrate on other aspects of resuscitation by taking the guess work out of the breathing equation. With a flow-inflating resuscitation bag, the clinician must concentrate on squeezing the bag appropriately each breath. That’s 40-60 breaths a minute!

LS: Do you see a benefit by having a manometer at the patient interface (on the Tee)?

AS: It allows the clinician to check the peak pressure/PEEP while also observing the quality of the seal for the mask and the appearance of the baby. Having a manometer attached to the care center can be distracting and requires the clinician to remove his/her eyes from the baby.

LS: Many clinicians have stated that feeling “lung compliance” with a resuscitation bag is very important. What are your thoughts on this considering that Neo-Tee does not allow for the “feel”?

AS: I do consider this to be a drawback from this device. The Neo-Tee is very mechanical and doesn’t allow the clinician to get a feel for what is going on inside the lungs. The flow-inflating resuscitation bag has a distinct advantage in this way, but there are ways to counter this problem. Listening to breath sounds, observing chest rise are still reasonable measures of assessment.

LS: Has the Neo-Tee prevented intubations that may have occurred by the use of other resuscitation devices? If so, how does this help support reducing healthcare costs? (Can an actual dollar savings be applied to your facility?)

AS: The Neo-Tee has helped by way of transporting the baby from the delivery room to the NICU. The Neo-Tee doesn’t need to be held on the ETT while squeezing the bag, which can cause the ETT to become dislodged. The Neo-Tee makes it easy to hold the airway in place while also providing consistent breaths during ventilation.

LS: How has Neo-Tee helped your department with respect to infection control?

AS: We’ve reduced the number of devices required from delivery to bedside emergencies. Having one device that is disposable reduces your chance for infection versus having two or more devices opened and being used.

LS: What else can you tell us about the Neo-Tee that you hadn’t mentioned, but has been beneficial and would be valuable for other clinicians to know?

AS: It helps to have a device that can’t be easily manipulated or damaged during a chaotic resuscitation or emergency. PEEP valves and flow restrictors can be moved or changed during hectic procedures. The Neo-Tee is always consistent.

Laszlo Sandor is assistant editor of Respiratory Therapy. Input on questions was provided by Scott Horowitz, Product Manager, Mercury Medical. If you would like to participate in this feature, as a company or healthcare provider, please contact Steve Goldstein at s.gold4@verizon.net.