

Biphasic Cuirass Ventilation and the United Hayek RTX Ventilator

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IVUN's last educational conference call was conducted in late August. The series of 10 calls was supported by funds from the national office of the March of Dimes (New York). The goal was to expose users of home mechanical ventilation with neuromuscular conditions to the options of devices available to them and to answer questions, specifically related to new problems due to aging and to phasing out of certain ventilators and their maintenance, for example the PLV[®]-100, 102 and 102b.

Gary W. Mefford, RRT, Vice President, Clinical Operations, Hayek Medical Devices, the final guest speaker, explained the functions of the RTX Ventilator, but first he described the complications of respiratory muscle weakness: difficulty breathing and clearing secretions.

Weak muscles impair cough, resulting in poor clearance of airway secretions, and impair chest wall range of motion and lung expansion. Recurrent infections exacerbate muscle weakness. Hypoventilation or underventilation is a key problem.

The Hayek is a ventilator. It is composed of a power unit and a chest shell or cuirass and can effectively treat hypoventilation with support that is non-mask and noninvasive. (It can be used if a trach is present.) It also provides a means of improving chest wall range of motion, pulmonary muscle tone and strength, and lung volume expansion.

The power unit connects via a hose to the cuirass that has a flexible foam seal that creates an air chamber over the chest and abdomen. The unit alternately applies negative and positive pressure to the chest and abdomen through the cuirass to duplicate the two phases of natural breathing – inhalation and exhalation.

The negative pressure causes the lungs to expand producing inhalation; positive pressure in the cuirass assists with exhalation. The device can provide several modes. One is the continuous negative pressure mode that provides negative pressure in the cuirass, which holds the ribs up and the diaphragm

down, so that one breathes from a greater FRC or functional residual capacity – the amount of air left in the lungs after exhalation. This mode is not for everyone because it does not provide support but it does open up the smaller airways, counters atelectasis and improves gas exchange in the lungs.



Continuous negative pressure is typically not the answer for patients with neuromuscular conditions. But, other modes are. Controlled ventilation is when the inspiration and expiration rate and duration are set and controlled by the machine. It is used in acute care to get people off of a ventilator, at night only or for just a few times during the day.

Triggered or respiratory synchronized breathing means that the device senses a user is inhaling and augments the breath, and then helps with expiration by placing

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positive pressure in the cuirass. The breaths are based on (synchronized with) the patient's own natural breathing.

The RTX is more than a ventilator because it can clear airways. The RTX provides high frequency chest wall oscillation that loosens secretions in the lower airways and brings them up and then provides a means of coughing.

When used for airway clearance the Hayek provides two sequential cycles that are set for duration and a number of total cycle repeats.

The first is oscillation. The device cycles negative and positive pressures in and out of the cuirass at high frequencies to provide a thinning effect on the mucus.

The second is the assisted cough caused by the RTX delivering a breath cycle that helps produce a good cough. This series of sequential cycles can be repeated as often as needed.

Mefford pointed out that when many physicians first hear about the biphasic cuirass ventilation they immediately think that it is old news, remembering the machines from the past.

Today, the Hayek RTX can be used in the home and in the various levels of the ICU. It can be used with a range of patients from small babies to people who weigh 350 pounds. In fact, currently more devices are placed in the home than in the hospital. The majority of patients who use it at home have a neuromuscular

condition such as post-polio syndrome, amyotrophic lateral sclerosis or muscular dystrophy. Finessing the settings can take some time, but once the RTX is set up, the system is relatively easy for vent users and caregivers to manage.

During his presentation, Mefford clarified that the Hayek RTX is manufactured by United Hayek, London, England, and

is distributed in the US by Hayek Medical Devices (Philadelphia, San Diego). A sister company, Personal Support Medical Supplies, supplies the device in the home.

Mefford's PowerPoint presentation can be viewed at www.ventusers.org/edu/Call-Hayektakealook.pdf



For more information, contact him at gary.mefford@hayekmedical.com or 855-243-8228.

Q & A:

Q: Has anyone put this device on a wheelchair?

A: It is possible but the current design does not have a battery backup, so to be mobile, one would need a power source.

Q: Is it possible to use the RTX 24 hours a day?

A: Yes, but with this qualification: There will be times, such as bathing and transfers when the cuirass will be off and there needs to be a predetermined strategy, such as nasal BiPAP or bag and mask. ■

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