Hands On: 10 cm of CPAP In a 10-oz. Package

By FRAN HILDWINE, BS, NREMT-P, CCEMT-P

The benefit of continuous positive airway pressure (CPAP) in the treatment of congestive heart failure (CHF) and pulmonary edema has been well documented. Patients treated with CPAP have a lower incidence of intubation and generally shorter stays when admitted to the hospital.

Progressive EMS systems have been using CPAP as one of their treatment options for several years. Two big issues for implementing an EMS CPAP protocol are the capital cost of the equipment and the need for the EMS crews to manage this additional piece of equipment during patient transport. The Boussignac (boos-ne-ack) CPAP System by Vitaid Ltd. addresses both of these concerns with a low-cost, lightweight, single-use device capable of delivering 2.5–10 cm H2 O of CPAP and easily stored in an airway kit.

The Boussignac CPAP System began its journey to the medical marketplace on July 11, 1973. On that day, a Brazilian-owned Varig Airlines Boeing 707 experienced a cabin fire and crashed at Orly Airport, Paris. The crash and fire killed 122 of the 134 people on board. Three patients with severe respiratory compromise were transported to the Henry Mondor Hospital in Paris where Georges Boussignac, MD, was the anesthesiologist in charge of the ICU. Dr. Boussignac determined that these patients needed high-flow oxygen and improvised a system to deliver CPAP. He secured a plastic bag supplied with low-pressure, high-flow oxygen around the patient’s head and placed an outlet hose in an 8–10 cm column of water. This setup maintained pressure against the airway structures, keeping them open, while allowing the patients to breathe on their own. The amount of pressure was regulated by changing the depth of the outlet hose within the column of water.
Understanding that most people would be uncomfortable with the concept of a plastic bag being secured around their head, Dr. Boussignac then worked on a method of providing CPAP with a more open system. He based his design on Bernoulli’s principle, which states that as the speed of a moving fluid increases, the pressure within the fluid decreases. This is demonstrated by the way a fluid (liquid or gas) moves faster as the diameter of the pipe through which it flows becomes narrower. The result was a 10-oz. plastic device that uses the physics of fluid dynamics to increase pressure when attached to a standard, well-fitting oxygen face mask.

The Boussignac CPAP device takes low-pressure, high-flow oxygen and accelerates it to nearly the speed of sound through a series of four micro-channels that then converge in an area of turbulence, forming a “virtual valve” that maintains positive airway pressure.

Operation of the device is straightforward. Attach the hose to a regular oxygen port capable of 10–25 L/minute (LPM) of flow and place the device into a well-fitting face mask that has an inflatable cuff. Determine the required level of CPAP, and select the desired flow rate. Oxygen flow at 10 LPM provides 2.5–3.0 cm H2 O of CPAP, 15 LPM = 4.5–5.0, 20 LPM = 7.0–8.0 and 25 LPM = 8.5–10.0.

Position the face mask on the patient, obtain a good seal and secure the mask with the provided four-point head strap. A monitoring port allows you to attach an airway pressure manometer to ensure the proper level of CPAP.

At a 25 LPM flow rate, an EMS crew can anticipate a full (2,200 psi) "D" cylinder of oxygen to last 14 minutes and a full “E” cylinder to last 23 minutes.

The open end of the Boussignac CPAP device provides several advantages over a closed system. A soft suction catheter can be passed through the opening to remove any fluids from the patient’s mouth without interrupting the CPAP treatment.

A standard medication nebulizer can also be placed in-line with the Boussignac device to help you deliver meds to the lungs faster. When set to a low level (2.0-4.0 cm H2 O) of CPAP, users can achieve a 30% increase in drug delivery and deeper lung penetration of the medication. The usual steaming exhalation of wasted medication is nearly eliminated. A second oxygen source is required to simultaneously power both the nebulizer and CPAP.
The Boussignac CPAP System is available for $65 from Vitaid Ltd.


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