A UNIVERSAL AIRWAY CIRCUIT CAP CONNECTOR (TIBBLECAP™)

Adam Tibble, MD; Alvin Lee, MD; William Mazzei, MD; Jon Benumof, MD
Department of Anesthesiology, University of California San Diego

Background: General anesthesia includes initial drug injections that induce unconsciousness and paralysis, causing a patient to stop breathing on their own. The ensuing moments are critical, as a failure to provide oxygen will result in cardiac arrest, brain damage, and ultimately, brain death. Anesthesiologists utilize a multitude of tubes, connectors, and adapters to provide oxygen to the patient during these critical times and throughout the duration of anesthesia. This abstract describes a novel universal airway connector (The TibbleCap™ - ActMD Inc., San Diego, CA) that ensures continuous delivery of life-sustaining oxygen.

The Design: Surprisingly, no other connector like it exists. With its "Christmas tree-like" design, the proximal end fits the standard 15mm airway circuit on all breathing systems. Then, the torso of the connector has ridges to ensure a tight seal and tapers down to a terminal end with an internal diameter of 6mm. This terminal diameter ensures adequate ventilation and negates air trapping[1]; and, it only imparts an air-flow resistance similar to that of a size 7.0 to 7.5mm endotracheal tube[2].

A Few of its Multiple Uses:

Intubating through a "classic" style laryngeal mask à Just cut the LMA!

"Classic" style laryngeal masks are used in approximately 8 million surgeries per year in the United States alone. In the event of a "difficult airway" or other scenario, the practitioner can use scissors to cut the LMA at a significantly shorter length, then, place the connector firmly into the laryngeal mask tube. The cutting of the LMA solves the problem of the LMA being too long, and the universal connector allows ventilation to resume while a fiberoptic bronchoscope is summoned. The connector's existence is what allows the practitioner to cut the LMA shorter and converts these LMAs into viable intubating conduits. The TibbleCap™ clearly enhances the utility of these laryngeal masks 1) in difficult airways; 2) in the pre-hospital ambulance or emergency department setting; 3) in elective C-spine cases requiring asleep fiberoptic intubation; and 4) as conversion to a secure airway for any patient with a previously placed "classic" LMA.

Life-saving oxygenation through the outer cannula of a patient's tracheostomy

Many tracheostomy designs have an outer cannula that does not connect directly to a 15mm airway circuit (ex. Shiley™). If a tracheostomy's inner cannula becomes occluded (mucous plugging, etc) as often occurs, the TibbleCap™ can seat firmly within the patient's outer cannula and provide vital oxygen.

Replacing a lost endotracheal tube cap

The endotracheal tube's associated 15mm airway circuit connector cap is often misplaced during fiber-optic intubation. As any anesthesiologist can tell you, it happens frequently. Instead of wasting a separate endotracheal tube solely for the use of its cap, the universal connector can be seated firmly into the endotracheal tube, allowing for ventilation.

Transtracheal Jet Ventilation (through a trans-cricothyroid membrane catheter)

Jet ventilation can take place through a traditional anesthesia machine's oxygen flush valve, but it requires an elaborate contraption of putting an endotracheal tube into a 5ml syringe and inflating the balloon to form a seal. The TibbleCap™ can be seated directly into the syringe (3cc, 5cc, or 10cc), and eliminates the need for an endotracheal tube. Jet ventilation can then be performed through the traditional anesthesia machine, using the oxygen flush valve, TibbleCap™ , syringe, and tracheal catheter.

Summary: This universal circuit cap connector is incredibly functional with many of the tubes, connectors, and airways that are used in medicine. In an emergent scenario, it is integral in obtaining a "secure" airway, a crucial step in providing oxygen to a patient, saving his or her life, and preserving brain function. Additionally, the cap has tremendous utility in c-spine patients, tracheostomy patients, and can function as a replacement tube cap. No other "universal" connector exists that can connect different sized lumens to the standard 15mm airway circuit, and it should be present in all hospitals, operating rooms, emergency departments, and code bags.

References:

1. Dworkin R, Benumof JL, Benumof R, Karagianes TG. The effective tracheal diameter that causes air trapping during jet ventilation. J Cardiothorac Anesth. 1990 Dec;4(6):731-6.
2. Tibble A, Lee A, Mazzei W, Manecke G, Benumof J. The Air Flow Resistance Profile of the Universal Airway Circuit Cap Connector (TibbleCap™) Compared to Various Endotracheal Tube Sizes. Abstract Submission. Society for Technology in Anesthesia – Anesthesia & Analgesia. January 2011.