Automating Matters Of The Heart: The LUCAS CPR Machine

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In our technologically oversaturated age, the plea for a more “human touch” has an almost nostalgic overtone. Be it wrinkled, flabby, feeble, or with a vague aroma of pharmaceuticals, most of us would prefer a hug from our grandma over even the most sophisticated, designed-for-optimal-embrace HugBot; yet, if grandma doesn’t get the hug quite right, or is a little too tired to give a good squeeze, we are rarely in danger of taking a stroll down a long tunnel of light. Sometimes, the “human touch” isn’t worth the warm-and-fuzzy feeling; automation, at times, trumps the human hand.

Sweden’s Jolife had developed the LUCAS, an automated device to provide CPR chest compressions, as an aid and supplement to the demands of EMTs, firefighters, and other medical professionals. Even the most well-trained medic is susceptible to fatigue or distraction. In addition, they may have other things to do besides providing continuous chest compressions, such as pulling victims out of a burning building or using a defibrillator, which would be too dangerous for an EMT providing manual CPR.

The wishbone shaped LUCAS 2 and its earlier incarnation, the LUCAS 1, can provide up to 100 sustained strokes per minute to victims of cardiac arrest with equal compression and decompression times. The new LUCAS is fully electric – powered up to 45 minutes by a Lithium Polymer (LiPo) battery – whereas the elder LUCAS is fully pneumatic and is powered by compressed air. The LiPo battery frees the LUCAS 2 of the need for a portable compressed air intake but adds about 3 lbs. to the original. The device is versatile in that it can be used during surgery or in

"uncontrolled" areas, such as the scene of an accident. According to Sara Lindroth, Marketing Director for Jolife,

"The LUCAS is designed to be used in almost every possible setting [. . .] including on the scene outside or even in confined spaces, ambulances, aircrafts during transportation, hospitals, during transport on a stretcher, or during other diagnostic or interventional therapies, such as coronary intervention in the cath [catheter] lab." Lindroth notes another advantage to the LUCAS design, namely, that its carbon-fiber back plate is fully radio-translucent and allows cath lab physicians to "work with all the oblique X-ray views" when treating clogged coronary arteries. In addition, the LUCAS "enables the doctor to continue life-saving cardiac intervention despite ongoing CPR, something that is very difficult with manual CPR."

The LUCAS was first introduced in conjunction with Lund University in southern Sweden – thus its christening as the "Lund University Cardiac Assist System" – and according to the Jolife website, resulted in a doubling of the number of discharged patients at the local hospital and a "better neurological recovery than earlier." Increased rates of spontaneous circulation have also been reported in other studies – 2007 in *Urgences & Accueil* and 2010 in *Circulation* – available on the Jolife website: www.jolife.com [1]. Another study, published in *Resuscitation*, concluded that "patients with a witnessed cardiac arrest receiving LUCAS-CPR within 15 minutes from the ambulance call had a 30-day survival of 25%," whereas those who received no CPR within "an interval of more than 15 minutes [resulted] in no 30-day survivors."

Although the LUCAS does not provide respiration, Lindroth notes that the device assists first responders in that it “can run in 30:2 mode (also called BLS mode), which means it will make a short alert signal before it is time for the rescuer to provide two breaths to the patient. After three seconds, the LUCAS starts 30 compressions again.” In this regard, the first responder cannot be entirely independent of the patient until respiration is self-sustained. The LUCAS is also not intended for use on children and may not fit those with unusual physiology; however, Lindroth states that the device “fit 95% of the cardiac arrest patients in a recent U.S. evaluation. 3% were too big; 2% too small.” The LUCAS is also not equipped to analyze when a patient’s heart has begun beating of its own accord. According to Lindroth, the “rescuer must still analyze the patient’s heartbeat regularly with the defibrillator, and when a normal rhythm appears on the ECG and the patient has a pulse, chest compressions can be discontinued.”

Although the LUCAS does not provide all components of the CPR process, it provides the most difficult and time consuming aspect. Both LUCAS 1 and LUCAS 2 are currently available for sale in the United States, as well as in Canada, Europe and Japan.

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[1] http://www.jolife.com