OPEN CHEST CARDIAC MASSAGE SIMULATOR

BACKGROUND

Open chest cardiac massage is an important technique in cardiac resuscitation. Although CPR external massage technique is an easier and more convenient method resuscitation, OCCM still has many advantages provided it is performed by medical professionals in a clinical setting.

OCCM facilitates greater cardiac output, 60% of normal compared to only 15–40 achieved by CPR. Also, in some animals with high (compared to humans) pitched rib cages such as canines, CPR must be performed on the animal's side lessening the effect of the compression on the heart. Thus this technique is especially appropriate for use by veterinary doctors. This technique is also practiced routinely by cardiologists who must stop and start the cardiac muscle during the course of an operation. Other types of medical specialists might use this technique during abdominal surgery. During such an operation cardiac arrest can occur accidently due to the presence of metabolites or anesthesia particles in the bloodstream that teach the heart and cause it to stop beating. In such a situation CPR would be quite inappropriate due to the exposed organs of the abdomen which could be damaged. Since the heart is easily accessed for massage from under the ribs or through an incision between two ribs, OCCM is the appropriate method for resuscitation.

Although OCCM is an invasive technique involving an incision it actually causes less internal damage than CPR which can cause fractured ribs, fractured sternum, cardiac contusion, ruptured liver, ruptured spleen, and lacerations of the vena cava and other vessels. OCCM also has the advantage of allowing the surgeon to temporarily suspend blood flow to the lower half of the body in order to increase oxygenated blood flow to the brain. This technique of resuscitation also allows for visual monitoring of the heart and is useful for patients with inelastic or barrel chests or after CPR has failed.

Presently, medical students receive little training and infrequent practice in OCCM. This is mainly due to the fact that training on humans is not legally or ethically feasible and the standard practice of using canines is both expensive and ethically undesirable as it involved inducing cardiac trauma in the animal. Because of these factors practice is minimal and extra or advanced practice is unlikely.

Although numerous devices have been created to instruct and practice CPR external heart massage such as "dummies" as in:

U.S. Pat. No. 3,049,811 (Reuben, Aug. 21, 1962)
U.S. Pat. No. 3,994,075 (Kohnke, Nov. 30, 1976)
U.S. Pat. No. 4,001,950 (Blumensaadt, Jan. 11, 1977)
U.S. Pat. No. 4,611,998 (Ramamurthy, Sep. 16, 1986)

and teaching aids not housed in mannequins such as:

U.S. Pat. No. 4,092,788 (Gowing, Jun. 6, 1978)
U.S. Pat. No. 4,619,617 (Rice, Oct. 28, 1986)

No such dummies or teaching aids are currently available to aid in the teaching of, or for practicing OCCM.

SUMMARY OF THE INVENTION

Recognizing the need for a device that can be used to demonstrate and provide practice in OCCM, the proposed embodiment utilizes a lifelike thorax housing an exposed flexible heart that can be manipulated or squeezed rhythmically to displace fluid from one reservoir into another. This process simulates venous return and oxygenated arterial transmission of blood to and from the body.

In addition to learning proper squeezing rhythm, the object of this invention is to provide proper feel of the hearts composition and the flow rates and fluid pressures within.

Another objective of this invention is to provide and OCCM training device that simulates various cardiac complications such as backup, flow restriction, and sudden increases and decreases in fluid pressure.

A further objective of this invention is to provide a suitable and less expensive replacement for the live animals that are currently being used in medical and veterinary schools to train students in OCCM technique. Also, to allow students more practice in a more convenient manner and to permit variations in practice exercises.

BRIEF DESCRIPTION OF DRAWINGS

Preferred embodiment of the invention will subsequently be described utilizing the following detailed descriptions as depicted in the attached drawings in which,

FIG. 1 is a perspective of a thoracic mannequin connected by two tubes to two calibrated cylindrical fluid reservoirs suspended by a stand.

FIG. 2 is a perspective of the thorax with skin covering pulled aside to reveal heart model, with practitioner's hand grasping it, connected to two tubes.

FIG. 3 is a perspective of the fluid systems comprising the hollow elastic heart model connected to the two cylindrical reservoirs by tubing fitted with regulatory and check valves.

REFERENCE NUMERALS IN DRAWINGS

5. heart model
10. regulatory valve
15. check valve
20. flexible tubing
25. output fluid reservoir
30. input fluid reservoir
35. check valve
40. regulatory valve
45. flexible tubing
50. thoracic mannequin
55. adjustable reservoir support stand

DESCRIPTION OF ILLUSTRATIVE EMBODIMENT

The illustrative embodiment comprises a thoracic mannequin **50** attached via two tubes **20, 45** to two reservoir cylinders **25, 30** and held vertically in place by adjustable stand **55**. A molded hollow heart **5** of elastic material having the approximate feel of an actual animal heart when filled with fluid is set within the thorax **50** having skin material peeled back to expose heart **5** and permit manipulation of said heart **5** by the practitioner's hand. The hollow heart **5** is connected to two tubes **20, 45** each containing a check valve **15, 35** and a regulatory valve **10, 40**. Check valve **15** is set opposite to check valve **35** to allow discharge only from model heart **5** to reservoir **30**; check valve **15** is set opposite to check valve **35** to allow intake only from reservoir **25** into modal heart **1**.