Manual Chest Compressions Equal if not Superior to Mechanical Chest Compressions for Cardiac Arrest Patients

LUCAS-2 mechanical chest compression device shows no improvement in overall survival rates compared to manual compressions by trained personnel.

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For patients who suffer from out of hospital cardiac arrest, cardiopulmonary resuscitation (CPR) using a mechanical compression device provides no benefit compared with classic manual chest compression by trained healthcare professionals, according to findings from the PARAMEDIC trial in the UK in November 2014.

Gavin E. Perkins, MD and fellow PARAMEDIC trial collaborators performed a pragmatic, cluster randomized, open-label trial over approximately 3 years. This trial evaluated whether survival rates might be improved when LUCAS-2 mechanical compression devices were used in lieu of manual chest compressions for patients suffering from out of hospital cardiac arrest.

The LUCAS-2 device administers chest compressions at a rate of 102 compressions per minute with a depth of 40-53 mm. The control group received standard manual compressions by trained paramedics, aiming for compressions at a rate of 100-120 per minute with a depth of 50-60 mm.

Involved paramedics were officially trained to use the LUCAS-2 device. Ambulances (clusters) were randomly assigned to use of the LUCAS-2 for the day. Individual cardiac arrest patients were allocated to receive compressions via the LUCAS-2 versus the control (manual chest compressions by EMS personnel) depending on which ambulance arrived first at the scene. Patients who had return of spontaneous circulation (ROSC) were then followed to assess outcomes.

The primary outcome measured was 30-day survival after cardiac arrest. Researchers found similar 30-day survival rates in the LUCAS-2 group versus the manual CPR group (6% versus 7% respectively; 95% CI, 0.64-1.15).

Secondary outcomes studied were ROSC until admission, survival to 3 months, survival to 12 months, and favorable neurological outcome at 3 months (defined as a cerebral performance category score of 1 or 2). Secondary outcomes between the LUCAS-2 and control groups were comparable.

Adverse events included bruising and lacerations of the chest and blood in the mouth. No serious adverse events were observed.

Interestingly, a subgroup analysis did find a possible difference in treatment effect between patients with initial presenting rhythm of pulseless electrical activity versus those with a shockable rhythm. Survival rate and neurologic outcomes were poorer in the LUCAS-2 group patients with an initial shockable rhythm. The differences were marginal and “not the primary objective of the trial and should be interpreted with caution and deemed as hypothesis generating,” the authors noted.

The authors further hypothesized that perhaps time spent attaching the LUCAS-2 caused a brief interruption in CPR, thereby reducing perfusion during that time.

According to the researchers, the PARAMEDIC trial "…was unable to show any superiority of mechanical CPR and highlights the difficulties of training and implementation in real world EMS systems."

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