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Success of Automated CPR Unclear, May Depend on Timing and Training

By Karla Gale

NEW YORK (Reuters Health) Jun 13 - Two trials comparing manual cardiopulmonary resuscitation (CPR) with an automated load-distributing band (LDB-CPR) yielded discrepant results, according to reports in the Journal of the American Medical Association for June 14.

The first study resulted in lower survival with LDB-CPR, whereas the second study demonstrated improved survival when the device was used.

According to editorialists Drs. Roger J. Lewis and James T. Niemann, the discrepancies may relate to "characteristics of the patient populations, presenting rhythm, time from cardiac arrest to initiation of CPR, and time-to-deployment and to defibrillation."

"Ultimately," co-author Dr. Joseph P. Ornato told Reuters Health, "it won't really matter who or what is pushing on the chest. What does matter is, are you circulating blood and oxygen effectively around the body and to the vital organs?"

"My hunch is that timing may be everything here," he continued. "We know that the earlier we can get the heart beating again and get good blood flow and good blood pressure to vital organs, the better the outcomes will be."

In the first paper, Dr. Al Hallstrom, from the University of Washington in Seattle, and his associates performed a multicenter, randomized trial of 1071 patients at one of five sites in the US and Canada, who were in cardiac arrest at the time of EMS arrival. Their final analysis included 373 patients randomly assigned to manual CPR and 394 to the AutoPulse LDB-CPR resuscitation system (Zoll Circulation, Sunnyvale, California).

To use this device, patients are laid supine on the backboard and an 8-inch wide LDB is wrapped around the patient's chest and is closed using Velcro. "Device-regulated, repetitive shortening of the belt squeezes the thoracic cavity, generating arterial circulation" at a rate of 80/min, the authors note.

In June 2005, the data and safety monitoring board recommended the trial be halted, based on interim analysis showing lower hospital discharge survival and worse neurological status.

The investigators observed no significant difference between treatment groups in survival at 4 hours after the 911 call had been made.

However, survival to hospital discharge was lower in the LDB-CPR group than in the manual CPR group (5.8% versus 9.9%, $p = 0.04$). Cerebral performance category score was 1 or 2 in 3.1% and 7.5%, respectively ($p = 0.006$).

Dr. Hallstrom's group was puzzled by these outcomes, because studies in animal models and observational human studies have indicated greater likelihood of return of spontaneous circulation with the LDB-CPR. They suggest that further research is required to elucidate the roles of the phase of arrest, drug usage, timing of defibrillation, and treatments such as hypothermia and coronary reperfusion.

The second research team -- Dr. Ornato, from Virginia Commonwealth University Medical Center in Richmond, and colleagues -- performed a phased, single-site, observational study that included 499 patients treated by manual CPR between January 2001 and March 2003, and 284 patients in the LDB-CPR phase between December 2003 and March 2005, using the same AutoPulse LDB-CPR device.

In the intention-to-treat analysis, 20.2% of patients in the manual CPR group and 34.5% in the LDB group experienced the return of spontaneous circulation.

In their statistical analysis, the authors adjusted for response time, proportion of arrests that were witnessed by EMS personnel, and whether post-resuscitation hypothermia was used. The adjusted odds ratio (AOR) was 1.94 in favor of LDB for return of spontaneous circulation. Results were similar for survival to hospital admission (11.1% versus 20.9%, AOR 1.88) and survival to hospital discharge (2.9% versus 9.7%, AOR 2.27).

The number needed to treat with LDB to achieve one additional case that would survive until hospital discharge was 15.

"We found that all the benefit from use of the mechanical device occurred in cases where paramedics got to the patient in under 8 minutes from the 911 call," Dr. Ornato noted.

Editorialists Dr. Lewis and Dr. Niemann, from Harbor-University of California Los Angeles Medical Center in Torrance, point out that multiple confounders could have affected outcomes, including unequal time lags to first shock for VF, heterogeneity of treatment sites, interaction of treatment effect and response time, unknown quality of CPR, and potential for enrollment bias.

In his interview with Reuters Health, Dr. Ornato stated that differences in training in use of the LDB-CPR may partially explain the differences between groups. "We put a great deal of emphasis on training of the paramedics in teams, with hands on experience, so that they could get the device applied as efficiently as possible."

Furthermore, he added, "it is imperative to provide continuous, uninterrupted compressions, not stopping to check for a pulse or to insert an IV."

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