機械的CPRと手動CPRの予後は同等である

LINC：機械的心臓マッサージの有効性は手動のCPRと同等である

LINC: Mechanical chest compressions are equally effective as manual CPR

心停止患者に対し心肺蘇生（CPR）を行う場合、心臓マッサージ中に除細動器を用いる機械的心臓マッサージの有効性は、手動の心臓マッサージと同等であるが、より優れてはいないとのLUCAS in Cardiac Arrest（LINC）スタディの結果が2013年European Society of Cardiology学会で発表された。このスタディは、院外心停止に対し蘇生を必要としたヨーロッパ6施設の患者2,589人を対象とした。救急医療担当者が現場に到着次第、直ちに全ての患者に対し手動による心臓マッサージが開始された。その後、手動の心臓マッサージ継続群（1,289人）または心臓マッサージ中に除細動器を用いる機械的心臓マッサージに切り換えられる群（1,300人）に無作為に割り付けられた。両群とも、ガイドラインに従い換気や薬物投与を施行された。CPR開始4時間後の生存率は、機械的CPR群と手動CPR群とで同等であった（23.6%対23.7%）。自己循環再開率や脈が触知できる状態で救急治療室に到着した患者数、集中治療室退室時に生存していた患者数、そして1および6か月後の神経学的予後などの後期予後もまた両群間で同等であった。

Full Text

Mechanical chest compressions with defibrillation during ongoing compressions are just as effective, but not superior to manual compressions, for delivering cardiopulmonary resuscitation (CPR) to patients in cardiac arrest, according to the results of the LUCAS in Cardiac Arrest (LINC) study presented at the European Society of Cardiology 2013 Congress.

"The study was designed to show a better 4-hour survival in the group treated with mechanical chest compressions, and this was not achieved," said lead investigator Sten Rubertsson, M.D., Ph.D., professor and specialist consultant at Uppsala University and Uppsala University Hospital.

"But we now have the scientific support to allow us to use mechanical chest compressions and defibrillate during ongoing compressions," he said, adding that this could potentially increase the efficiency and safety of emergency personnel as they deliver care during transportation of patients.

The LINC study included 2,589 patients from six European sites who had suffered an out-of-hospital cardiac arrest and needed resuscitation.

Manual chest compressions were started on all patients as soon as EMS personnel arrived on the scene.

Patients were then randomized to either be kept on manual chest compressions (n=1,289) or be switched to mechanical compressions with defibrillation during ongoing chest compressions (n=1,300). Mechanical chest compressions were delivered with the LUCAS Chest Compression System (Physio-Control/Jolife AB, Lund Sweden), a piston-driven device with a suction cup designed to deliver compressions according to resuscitation guidelines. In both groups, ventilation and drugs were given according to guidelines.

The study showed that four hours after the initiation of CPR, survival rates were similar in both the mechanical and manual CPR groups (23.6% versus 23.7%).

Later outcomes were also similar, including the rate of restoration of spontaneous circulation, the number of patients who arrived at the emergency room with a palpable pulse, the number of patients who survived until discharge from intensive care, and neurological outcomes at one and six months.

Theoretically, mechanical chest compressions should offer an advantage over manual chest compressions because the latter often have insufficient depth, incorrect rate and frequent interruptions, explained Dr. Rubertsson.

"The efficacy of traditional manual chest compression is heavily dependent on the skills and endurance of rescuers, and is compromised by periods of hands-off time and transportation interruptions," he said. Even at high efficiency it delivers only approximately 30% of normal cardiac output, resulting in decreased blood flow to vital organs." Mechanical compressions should theoretically improve CPR, but to date there is no definitive evidence from large randomized trials to show this.

Two randomized pilot studies of out-of-hospital cardiac arrest patients have compared mechanical chest compressions with mechanical compressions from the LUCAS device, and neither study found any significant difference between groups; however, the study populations were small.

The results of the current study the two approaches are equivalent, said Dr. Rubertsson, although, he said slight adjustments to the treatment algorithms might result in clinically significant differences in the future.

"With the algorithm we used for mechanical CPR we found that time to first defibrillation was delayed compared to manual CPR and this could explain why we were not able to show improved outcome. Therefore in the future we will recommend defibrillation without delay, before deployment of the device."

Regarding safety, "I would say that we can deem the device is safe, based upon the low number of severe adverse events and adverse events reported in the study, " he said.

"Survivors at 6 months had good neurologic outcome (99% in the mechanical group and 94% in the manual) and in a previously published pilot study of 85 patients we did not find any difference between groups in injuries at autopsy. What remains to be finally analyzed is the cohort of 200 patients within LINC that underwent autopsy."

Evidence showing equal efficacy for both manual and mechanical compressions is an added benefit to Emergency Medical Systems (EMS) workers. "EMS workers can now use a device to provide CPR which means they have an extra pair of hands available for other possible interventions," said Dr. Rubertsson. "Safety during transportation in the ambulance can also be improved since now the crew can have safety belts and still provide CPR."

He emphasized that the results of the LINC trial are only applicable to the LUCAS device and cannot be generalized to other mechanical chest compressors.

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