Clinical Summary

Significantly improved ROSC rates in the Emergency Department using LUCAS chest compressions, a team-focused resuscitation strategy and video-reviews

Rolston, DM, Li T, Owens C, et al. Mechanical, team-focused, video-reviewed cardiopulmonary resuscitation improves return of spontaneous circulation after emergency department implementation. *J Am Heart Assoc.* 2020;9:e014420. DOI: 10.1161/JAHA.119.014420

Aim

To evaluate cardiac arrest outcomes before and after initiation of mechanical CPR using the LUCAS device, a team-focused nurse-led Advanced Cardiac Life Support (ALS) strategy as well as video-review of the CPR intervention (MTV-CPR) in the Emergency Department.

Primary outcome: The return of spontaneous circulation rate before and after the implementation of MTV-CPR.

Secondary outcomes: Survival to admission and discharge.

Method

Emergency department staff at North Shore University Hospital started to use the LUCAS® chest compression system, adopted a new team-focused strategy with nurse-led ALS, and performed a multidisciplinary biweekly video review of resuscitations.

The team implemented:

- personalized feedback based on video review for those placing the LUCAS device on patients
- new assignment of roles for an eight-person response team during resuscitation efforts
- a coordinated transition method for technicians to go from manual to mechanical CPR to reduce interruption to CPR

> "Our data support the benefit of actively reviewing and improving on real-world CPR techniques to save peoples' lives. When we saw a problem, we developed new protocols to overcome each challenge."
>
> Lance Becker, MD

Results

- A total of 248 patients were included in the study; 97 before and 151 after implementation of MTV-CPR.
- ROSC was significantly higher after the implementation of MTV-CPR (41% versus 26%; P=0.014).
- These findings were consistent for both out-of-hospital cardiac arrest patients (21.9% preintervention versus 33.9% postintervention) and patients with in-hospital cardiac arrest (37.5% preintervention versus 58.5% postintervention)
- After controlling for covariates, the odds of return of spontaneous circulation remained higher with MTV-CPR than before (odds ratio, 2.11; 95% CI, 1.14–3.89).
- There were nonsignificant increases in survival to admission (26% versus 20%; P=0.257) and survival to discharge (7% versus 3%; P=0.163). Median chest compression fraction was 88%.
- The video review revealed interruption in chest compressions secondary to successful LUCAS device placement was a median of 50 seconds. This was a sum of all device-related interruptions during the resuscitation event; interruptions at back plate placement, at upper part application, and in some cases interruptions due to a need of repositioning of the device, and in rare cases stops to operation due to e.g. battery depleted.[1]
- The video revealed a median interruption in chest compressions secondary to EMS to ED bed transfer of 5 seconds, and at each defibrillation attempt of 20 seconds.

Conclusions

Implementation of mechanical CPR using the LUCAS device, a team-focused strategy and video-reviewed CPR intervention for cardiac arrest patients in the emergency department significantly improved return of spontaneous circulation rates. Survival to hospital admission and discharge did not improve significantly.

Discussion points

- This study shows that mechanical CPR using the LUCAS device, a team-focused approach with clearly defined tasks and roles, as well as implementing regular performance review using video recordings and training sessions can significantly improve the rate of successful resuscitation outcomes in the emergency care department.
- Having a clear strategy when and how to apply the LUCAS device is important. In this study, the LUCAS device was applied after first or second pause in chest compressions for pulse checks. This approach focuses on and minimizes delays to defibrillation in VF patients, who have the highest chance to respond to the early defibrillations.
- Interruptions to CPR should be minimized. In this study two ED technicians coordinated manual CPR and LUCAS device placement on each patient with cardiac arrest, being new to the device initially. The video review showed the sum of all interruptions during the use of LUCAS device over resuscitation events was a median of 50 seconds. This time summed up all pauses including both device application and stops during use. The study authors commented that they are initiating a quality improvement to reduce interruptions.
- One agency has, in a different publication, demonstrated that a quality improvement program can reduce interruptions in chest compressions due to LUCAS device placement from 21 to 7 seconds in the prehospital setting.[2] Another publication from a hospital trial found that the interruptions due to the application of the LUCAS back plate and upper part were typically less than 10 seconds each.[3]

> "Enhanced resuscitation education has the potential to improve patient outcomes as much as any new scientific breakthroughs in the field."
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> Cheng A, Nadkarni VM, Mancini MB, et al. Resuscitation education science: educational strategies to improve outcomes from cardiac arrest: a scientific statement from the American Heart Association. *Circulation*. 2018;138:e82–e122.

References

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3. Couper K, Quinn T, Booth K et al, Interruptions in CPR during deployment of a mechanical chest compression device: results from a randomized controlled trial (COMPRESS-RCT). *Resuscitation* 2019: 142 (S1); e36 (AP018)

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