Use of an automatic mechanical chest compression device for cardiopulmonary resuscitation during percutaneous coronary interventions

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BACKGROUND:

When cardiac arrest occurs, cardiopulmonary resuscitation (CPR) with manual chest compressions is the first life-saving manoeuvre that must be implemented in order to maintain adequate organ perfusion pressure. However further treatments have to be given to solve the cause of the cardiac arrest. As often cardiac arrest is due to acute occlusion of the coronary arteries, percutaneous coronary intervention (PCI) can be considered as the mainstay of causal treatment. However the need for continuous manual CPR often limits the possibilities for optimal PCI performance. Mechanical chest compression with the Lund University Cardiac Arrest System (LUCAS, Jolife, Lund, Sweden), which is a gas-driven sternal compression device, mostly plastic and not fully radiopaque, that incorporates a suction cup for active decompression, may allow performance of the PCI under continuous chest compressions. We report here our experience using the LUCAS in the catheterization laboratory for emergent percutaneous coronary procedures.

METHODS:

Fifteen months ago, the LUCAS has been introduced in the emergency department of our hospital. It has been used in our catheterisation laboratory during procedures complicated by cardiac arrest and cardiogenic shock or during procedures performed in patients already under mechanical CPR, started out-of-hospital or in the emergency department.

RESULTS:

The LUCAS was used in 5 patients (2 males, 3 females, mean age 66.6 years) needing PCI. One stable patient underwent PCI of the ostial left anterior descendens. Intraprocedural stent thrombosis with acute occlusion of the left main occurred (images left side), leading to cardiac arrest. A second stable patient was sent for elective PCI of the marginal branch. After intracoronary administration of nitrates, she developed severe hypotension leading to cardiogenic shock. A third unstable patient presented with stent thrombosis after recent PCI of the ostial left circumflex. Intraprocedural occlusion of the left main occurred, leading to cardiac arrest. In all these patients, CPR with LUCAS was started and further percutaneous treatment of all these patients was successfully performed under direct and continuous thorax compression with LUCAS. From the clinical point of view, complete recovery was gained in the first 2 patients, however the third died. In 2 additional patients with acute myocardial infarction and out-of-hospital cardiac arrest, unresponsive to standard CPR, the LUCAS was implemented in the emergency department. Further PCI was attempted under continuous LUCAS massage. In both cases the PCI could be performed with procedural success (in one of the 2 patients PCI of the left anterior descendens and of the right coronary artery [see images right side] was done in the same session), however the clinical conditions of the 2 patients did not improve after the intervention and both did not survive.

CONCLUSIONS:

We conclude that the LUCAS device allows for continuous and effective thorax compressions also during PCI in acute unstable situations. In particular, it can be life-saving during elective PCI that become complicated because of acute events. Whether the LUCAS can improve the outcome of patients with out-of-hospital arrest enabling PCI performance, should be further investigated. However, the feasibility of this approach also in these situations seems possible, allowing adequate systemic blood pressure in most patients.