# Extracorporeal life-support in patients requiring CPR

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In today's *Lancet*, Yih-Sharng Chen and colleagues[1] show the possible benefits of extracorporeal life-support in adults receiving cardiopulmonary resuscitation (CPR) in hospital for more than 10 min for problems of cardiac origin. Irrespective of the advancements made in conventional CPR, median survivals to discharge after involvement of emergency medical services are only 6·4% for out-of-hospital cardiac arrest and 13·4–17·0% for in-hospital arrest.[2,3] The probable causes of high mortality in cardiac arrest are: a lack of return to spontaneous circulation; re-arrest after such a lack of return because of haemodynamic instability; and late death because of multiple organ dysfunction, including hypoxic brain injury due to ischaemic or reperfusion injury.

Extracorporeal life-support in cardiac arrest uses a percutaneous system that incorporates the rapid initiation of femoral-femoral venoarterial cardiopulmonary bypass by a trained vascular-access team, followed by the extracorporeal maintenance of circulation until an effective cardiac output has been achieved (figure). Extracorporeal circulation enhances coronary blood flow and preserves myocardial viability, and thus reduces time to the return of spontaneous circulation.[4] Also, extracorporeal life-support supplies oxygenated blood to multiple organs, prevents organ dysfunctions, and increases the likelihood of late survival after cardiac arrest. Moreover, during extracorporeal life-support, causes of arrest can be diagnosed and definitive treatments that target underlying causes can be started. Additionally, hypothermia can be easily induced to reduce hypoxic brain injury.[5]

Extracorporeal life-support in cardiac arrest has been described as a means to improve survival and as an extension of conventional CPR. However, no criteria are available to identify appropriate candidates for the procedure, and the upper limit for continuing CPR before extracorporeal life-support has not been established in terms of neurological outcomes. The 2005 American Heart Association guidelines for CPR and emergency cardiovascular care[6] recommend that extracorporeal life-support should be considered for patients in hospital who have a cardiac arrest when the duration of no-flow arrest is brief and the condition leading to the arrest is reversible (class IIb).[6] Moreover, protracted CPR decreases survival rates both during extracorporeal life-support and conventional CPR.[1,7] Thus extracorporeal life-support is probably better used as soon as possible to keep ischaemic times to a minimum and improve outcomes. Chen and colleagues[1] conclude that extracorporeal life-support benefits patients who have in-hospital cardiac arrest of cardiac origin and receive conventional CPR for more than 10 min. Furthermore, available results indicate that the application of extracorporeal life-support in cardiac arrest improves survival and the likelihood of a satisfactory neurological outcome.[1]

However, no study has provided clear evidence of the merits of extracorporeal life-support in patients with out-of-hospital cardiac arrest, although many case reports and case series have concluded about its effectiveness.[4,8,9] Cardiotoxicity, severe accidental hypothermia, and recurrent ventricular fibrillation are three widely accepted indications for emergency cardiopulmonary bypass support in patients with protracted cardiopulmonary arrest outside the catheter laboratory.[6,8,9] Shin and colleagues[9] reported a successful resuscitation after out-of-hospital arrest in a patient with recurrent ventricular fibrillation who was unresponsive to conventional CPR. Thus we hope that extracorporeal life-support will be extended to

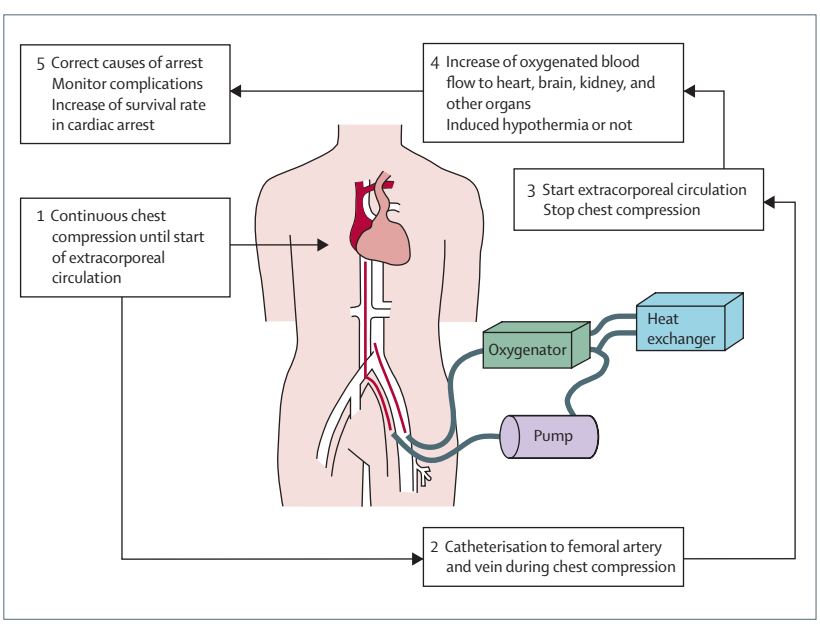


***Figure:*** **Extracorporeal life-support in cardiac arrest**

out-of-hospital patients when the arrest is witnessed and basic life-support before the patient reaches hospital sufficiently maintains perfusing rhythms, if only transiently.[9]

The complications associated with extracorporeal life-support are: catheterisation failure, local haematoma and vascular injury, bleeding, haemolysis, thromboembolism, and lower limb ischaemia.[10] Local complications could be reduced by sonoguided catheterisation, by using a bridge catheter to the lower limbs, and by training specialised medical teams. Furthermore, active clotting times should be checked and echocardiography done frequently to prevent bleeding and thromboembolic complications. Haemolysis is an important issue for extracorporeal life-support systems,[10,11] but damage to blood cells will be reduced to tolerable levels by improvements in blood-pump technology.[11]

Extracorporeal life-support provides a potential means of overcoming the limitations of advanced cardiopulmonary life-support in cardiac arrest, and we congratulate Chen and colleagues for their efforts to develop an evidence base for such systems. Future studies should use subgroups of patients with cardiac arrest of cardiac origin and no response to the conventional CPR for more than 10 min who are likely to benefit from extracorporeal life-support. Moreover, if progress is satisfactory, we expect that patients getting conventional CPR will benefit from extracorporeal life-support in the near future.

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We declare that we have no conflict of interest.

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