A New Therapeutic Strategy
For Refractory Cardiac Arrest Including Prehospital Ecmo: A Comparison Study


ICU - SAMU de Paris (EMS)
Sudden death expertise center
Necker University Hospital, Paris, France
Conflict

- Maquet : Others Research support Modest
• Existing evidence for in hospital CA ECMO

Figure 3: Kaplan-Meier plot of the survival curves in the extracorporeal CPR-M and conventional CPR-M groups for 1 year
Lancet 2008; 372: 554-61
Introduction

• Existing evidence for in hospital CA ECMO
• Difference in prognosis for In and Out of hospital CA

Le Guen M et Al Crit Care Med 2011, 15 R29
Introduction

- Existing evidence for in hospital CA ECMO
- Difference in prognosis for In and Out of hospital CA
- In relation with the low flow duration

<table>
<thead>
<tr>
<th></th>
<th>Odds ratio</th>
<th>95% confidence interval</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>30-day survival</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Out-of-hospital cardiac arrest</td>
<td>0.94</td>
<td>0.68–1.27</td>
<td>0.67</td>
</tr>
<tr>
<td>Time interval from collapse to start of extracorporeal life support (every 1 min)</td>
<td>0.98</td>
<td>0.96–0.99</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Initial rhythm of ventricular fibrillation</td>
<td>1.32</td>
<td>1.00–1.78</td>
<td>0.048</td>
</tr>
<tr>
<td>1-year survival</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Out-of-hospital cardiac arrest</td>
<td>0.99</td>
<td>0.73–1.33</td>
<td>0.95</td>
</tr>
<tr>
<td>Time interval from collapse to start of extracorporeal life support (every 1 min)</td>
<td>0.98</td>
<td>0.96–0.99</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Initial rhythm of ventricular fibrillation</td>
<td>1.28</td>
<td>0.98–1.70</td>
<td>0.07</td>
</tr>
</tbody>
</table>

Kagawa E et coll Resuscitation:81, 2010, 968-973
Introduction

- Existing evidence for in hospital CA ECMO
- Difference in prognosis for In and Out of hospital CA
- In relation with the low flow duration
- we developed a pre hospital ECMO strategy to reduce the low flow => Period 1

Lamhaut et coll Resuscitation. 2013 Nov;84(11):1525-9
Introduction

• Existing evidence for in hospital CA ECMO
• Difference in prognosis for In and Out of hospital CA
• In relation with the low flow duration
• we developed a pre hospital ECMO strategy to reduce the low flow duration => Period 1
• Secondarily we developed a « global ECMO strategy » => Period 2
• The goal of this study is to compare these 2 periods
Period 1


Cardiac Arrest + BLS by witness

BLS + AED by firefighters

T=0

ALS by MICU following ILCOR’s guidelines

After 10 min of ALS => ECMO Team activation

In or pre-hospital ECMO decision depending on:
- ECMO mobile team availability
- Location...

After 20 min of ALS => ECMO Decision
ECMO indications for refractory cardiac arrest

Possible Indication

Intoxication †
Hypothermia †
(≤ 32° c)

Signs on life during CPR

Refractory CA

Uncertainty

NO FLOW duration

0-5 min

VF VT

LOW FLOW duration

ETCO$_2$ ≥ 10 mmHg AND
Low-flow ≤ 100 min *

ETCO$_2$ < 10 mmHg OR
Low-flow > 100 min

Co-morbidity

Cardiac rhythm evaluation

Asystole
Pulseless activity

French National guidelines
SFAR SRLF CFRC …
B Riou et al 2009
Cardiac Arrest + BLS by witness

BLS + AED by firefighters

ALS by MICU following ILCOR’s guidelines
Epinephrine max 5 mg

ECMO Team activation (Available 24/24-7/7)
In or pre-hospital ECMO decision depending on:
- Location
- Circumstances

After 20 min of BLS with AED => ECMO Decision
Period 2

- **Adults > 18 and < 75 years of age**
- **And** Refractory cardiac arrest (= failure of professionals to resuscitate at the 20th minute of CA with a minimum of 3 AED or equivalent analysis)
- **And** no flow < 5 min with shockable rhythm or presence of signs of life or hypothermia or intoxication
- **And** ETCO2 above 10 mm Hg at the time of inclusion
- **And** Absence of major co-morbidity
### Results (1)

<table>
<thead>
<tr>
<th></th>
<th>Period 1</th>
<th>Period 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>N</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Age +/- SD</strong></td>
<td>51 +/- 3</td>
<td>53 +/- 0</td>
</tr>
<tr>
<td><strong>No flow min +/- SD</strong></td>
<td>3 +/- 4</td>
<td>2 +/- 3</td>
</tr>
<tr>
<td><strong>Shockable rythmes % (n)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Origin of Cardiac Arrest:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Cardiac</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Intox. or Hypothermia</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>• Angiogram % (n)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>• PCI % (n)</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Results (2)

<table>
<thead>
<tr>
<th></th>
<th>Period 1</th>
<th>Period 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=115</td>
<td>N=16</td>
</tr>
<tr>
<td>Prehospital ECMO % (n)</td>
<td>40% (46)</td>
<td>50% (8)</td>
</tr>
<tr>
<td>Survival CPC 1-2 % (n)</td>
<td>8% (9)</td>
<td>31% (5)</td>
</tr>
<tr>
<td>Brain Death % (n)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organ donation % (n)</td>
<td>36% (41)</td>
<td>10% (12)</td>
</tr>
<tr>
<td>Procedure Failed % (n)</td>
<td>11% (13)</td>
<td>12% (2)</td>
</tr>
</tbody>
</table>

*P < 0.05*
Times

Period 1 N= 115
Period 2 n= 27
Discussion and limitations

• Increase of survival rate

• Multiple criteria changed between periods 1 and 2:
  – Special training
  – Inclusion criteria
  – Limitation of epinephrine
  – Low flow
  – Prehospital ECMO

• Not an RCT
• Increased survival rate
• Need of a global approach with dispatch center / EMS / ICU / Cardiologist....
• The indication of pre-hospital ECMO needs to be confirmed by a RCT
Next step... RCT

ClinicalTrials.gov
A service of the U.S. National Institutes of Health

Find Studies > About Clinical Studies > Submit Studies > Resources > About This Site

Home > Find Studies > Search Results > Study Record Detail

Trial record 1 of 1 for: lamhaut
Previous Study | Return to List | Next Study

A Comparative Study Between a Pre-hospital and an In-hospital Circulatory Support Strategy (ECMO) in Refractory Cardiac Arrest (ACPAR2)

This study is not yet open for participant recruitment. (see Contacts and Locations)

Verified August 2015 by Assistance Publique - Hôpitaux de Paris

Sponsor:
Assistance Publique - Hôpitaux de Paris

Collaborator:
Maquet Cardiovascular

Information provided by (Responsible Party):
Assistance Publique - Hôpitaux de Paris

ClinicalTrials.gov Identifier:
NCT02527031

First received: August 13, 2015
Last updated: August 24, 2015
Last verified: August 2015

History of Changes

Full Text View Tabular View No Study Results Posted

Disclaimer Help Studies by Topic Glossary

lionel@lamhaut.fr