Massage Cardiaque Externe

Manuel vs Automatisé

Un combat gagné d’avance ?
HISTORIQUE

MCE

• 1960
• Kouwenhoven
• Compressions manuelles actives
• Décompressions passives


STOUT HA.
## HISTORIQUE

<table>
<thead>
<tr>
<th>MCE</th>
<th>Cardiopump</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
<td>1992</td>
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<tr>
<td>Kouwenhoven</td>
<td>Décompressions passives</td>
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<td>Compressions manuelles actives</td>
<td></td>
</tr>
<tr>
<td>Décompressions passives</td>
<td>Cardiopump</td>
</tr>
</tbody>
</table>

- 1960
- Kouwenhoven
- Compressions manuelles actives
- Décompressions passives
Les Etudes

Reported survival at 1 year was significantly greater among patients who underwent ACDC-CPR as compared to patients who received S-CPR (5% vs 2%, P = .03).
The rate of patients lacking neurologic impairment at the time of hospital discharge was significantly greater in the ACDC-CPR patients as opposed to the S-CPR patients (6% vs 2%, P = .01).

n: 750

Plaisance P, Lurie KG, Vicaut E, et al.  
Les Études

The authors found no significant difference in the survival rates between the 2 groups: S-CPR (12%) vs ACDC-CPR (13%).

n : 302

Skogvoll E, Wik L.
HISTORIQUE

MCE automatisé
• Année 90-2000

Lund University Cardiopulmonary Assist System
Of 100 patients studied, 31% had a stable ROSC and were subsequently admitted to the intensive care unit. Of the patients with witnessed cardiac arrest who received LUCAS-CPR within 15 min from the ambulance call (n = 43), 16% survived for 30 days with good neurologic outcome.

Les Etudes

AutoPulse produces a CPP of ~ 21 mm Hg compared to ~ 14 mm Hg produced by S-CPR and generates ~ 36% of normal coronary blood flow compared to ~ 13% generated in the S-CPR device.

Use of an automated, load distributing band chest compression device for out-of-hospital cardiac arrest resuscitation.
1er round : MCE ?

Délai mise en place ??

<table>
<thead>
<tr>
<th>Patients</th>
<th>Âge (ans)</th>
<th>Sexe</th>
<th>conditions de mise en place</th>
<th>Délai de mise en place (sec)</th>
<th>Conditions d’utilisation</th>
<th>Pouls carotidien</th>
<th>Pouls fémoral</th>
<th>Doppler</th>
<th>RACS (min)</th>
<th>Durée d’utilisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>66</td>
<td>F</td>
<td>5</td>
<td>90</td>
<td>5</td>
<td>Non</td>
<td>Oui</td>
<td>NR</td>
<td>non</td>
<td>20</td>
</tr>
<tr>
<td>2</td>
<td>54</td>
<td>F</td>
<td>5</td>
<td>30</td>
<td>5</td>
<td>Non</td>
<td>Oui</td>
<td>NR</td>
<td>non</td>
<td>30</td>
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<tr>
<td>3</td>
<td>71</td>
<td>F</td>
<td>5</td>
<td>60</td>
<td>5</td>
<td>Oui</td>
<td>Oui</td>
<td>Oui</td>
<td>Oui</td>
<td>45</td>
</tr>
<tr>
<td>4</td>
<td>58</td>
<td>M</td>
<td>5</td>
<td>60</td>
<td>5</td>
<td>Oui</td>
<td>Oui</td>
<td>Oui</td>
<td>non</td>
<td>20</td>
</tr>
<tr>
<td>5</td>
<td>71</td>
<td>M</td>
<td>4</td>
<td>120</td>
<td>4</td>
<td>Oui</td>
<td>Oui</td>
<td>NR</td>
<td>non</td>
<td>45</td>
</tr>
<tr>
<td>6</td>
<td>80</td>
<td>M</td>
<td>5</td>
<td>30</td>
<td>5</td>
<td>Oui</td>
<td>Oui</td>
<td>Oui</td>
<td>Oui</td>
<td>12</td>
</tr>
<tr>
<td>7</td>
<td>79</td>
<td>M</td>
<td>5</td>
<td>60</td>
<td>5</td>
<td>Oui</td>
<td>Oui</td>
<td>Oui</td>
<td>non</td>
<td>20</td>
</tr>
<tr>
<td>8</td>
<td>76</td>
<td>F</td>
<td>5</td>
<td>90</td>
<td>5</td>
<td>Non</td>
<td>NR</td>
<td>Non</td>
<td>non</td>
<td>30</td>
</tr>
<tr>
<td>9</td>
<td>79</td>
<td>F</td>
<td>5</td>
<td>20</td>
<td>5</td>
<td>Non</td>
<td>Non</td>
<td>Non</td>
<td>non</td>
<td>9</td>
</tr>
<tr>
<td>10</td>
<td>20</td>
<td>M</td>
<td>4</td>
<td>60</td>
<td>5</td>
<td>Oui</td>
<td>Oui</td>
<td>NR</td>
<td>Oui</td>
<td>25</td>
</tr>
<tr>
<td>11</td>
<td>51</td>
<td>M</td>
<td>3</td>
<td>180</td>
<td>5</td>
<td>Oui</td>
<td>Oui</td>
<td>NR</td>
<td>Oui</td>
<td>20</td>
</tr>
</tbody>
</table>

| Médiane (ET) | 64 (±18) | 5 (±0.5) | 60 (±31) | 5 (±0.3) |          |          |          |        |            | 20 (±10.4) |

AGOSTINUCCI JM, DESMAIZIÈRES M, BERTRAND P, GRAVELO S, GARRIGUE B, LECLERCQ G, LAPOSTOLLE F
Etude de faisabilité et d’efficacité du massage cardiaque externe par le système de compression thoracique mécanique Autopulse™. résultats préliminaires
La Revue des SAMU - 2005 - 4
1er round : Arbitrage

Savoir mettre en place le dispositif

Equipes entrainées et habituées au matériel.
2 équipes distinctes : MCE / Autopulse™
2\textsuperscript{nd} round : MCE-A par fatigue

l'efficacité du MCE manuel se dégrade après la première minute de massage,

il est recommandé d’assurer une rotation toutes les 1 à 2 minutes afin de garder les bons critères de massage cardiaque (rapport compression-décompression, fréquence à 100 par minute).

Chi CH, Tsou JY, Su FC.
Effects of compression-to-ventilation ratio on compression force and rescuer fatigue during cardiopulmonary resuscitation
3ième round : MCE-A par pression

Meilleure perfusion coronaire
Meilleure hémodynamique

amélioration significative de la PA
diastolique, systolique et moyenne
observée sous AutoPulse™ comparée au
MCE manuel dans l'AC prolongé

Timerman S, Cardoso LF, Ramires JA, Halperin H.
Improved hemodynamic performance with a novel chest compression device during treatment of in-hospital cardiac arrest
Fig. 2. Phasic vascular pressure traces during manual and A-CPR in two patients (A, B) reproduced from digital recordings. Record A shows one of the largest changes observed in aortic pressure and the diastolic aortic and right atrial pressure difference (coronary perfusion pressure) produced by A-CPR when compared to manual CPR. Record B shows a patient where the diastolic aortic and right atrium differences are near the mean values observed in this study.
Duchateau F.-X., Gueye P., Curac S., Tubach F., Broche C., Plaisance P., Payen D., Mantz J., Ricard-Hibon A.

**Effect of the AutoPulse automated band chest compression device on hemodynamics in out-of-hospital cardiac arrest resuscitation.**

*Intensive Care Med 2010; 36, 7 : 1256-60*
4ième round : MCE pour les indications

Situations nécessitant une prolongation de la durée du massage cardiaque externe telles que :

- intoxication médicamenteuse,
- hypothermie,
- Thrombolyse de sauvetage.
- troubles métaboliques,
- patient victime d’un arrêt cardiaque sous AG, en salle de coro.

European Resuscitation Council Guidelines for Resuscitation 2010

Et le transport de certains patients ……
5ième round : MCE

- ENCOMBREMENT
- POIDS
- AUTONOMIE
- NE CONCERNE QUE L’ADULTE

- Pas de recommandations officielles
Etude Tchèque: 30 patients: A-CPR 8, L-CPR 11, and M-CPR 11

Use of mechanical chest compression devices was associated with increased incidence of injuries compared to manual CPR but surprisingly also with a trend to worse survival.

• Injuries were observed in 7/8 (87.5%) in A-CPR, 8/11 (72.7%) in L-CPR, and 3/11 (27.3%) in M-CPR group (P = 0.02).
• Sternal fractures were present in 3/8, 4/11, and 1/11 (P = 0.33), multiple rib fractures (≥3) in 4/8, 6/11, and 2/11 (P = 0.25), and mediastinal haematomas in 5/8, 2/11, and 0/11 patients (P = 0.003). Pericardial effusions (2 pts) and adventitial aortic haematomas (4 pts) were observed in A-CPR group only (P = 0.06 and 0.002).

Truhlar A, Hejna P, Zabka L, Zatopkova L, Cerny V.
Injuries caused by the autopulse and LUCAS II resuscitation systems compared to manual chest compressions
Etude Irlandaise: 40 patients in the LUCAS CPR group and 39 in the manual CPR group.

We did not identify a significant variation in trauma with the use of the LUCAS compared to manual CPR. We do not believe that use of this device should be withheld on the basis of trauma related to CPR.

- Rib fractures were present in 13/40 in the LUCAS CPR group and 19/39 in the manual CPR group.
- Sternal fractures were present in 9/40 in the LUCAS CPR group and 16/39 in the manual CPR group. Pearson’s Chi-Square Test, $P = 0.144$.
- Mean number of rib fractures in the LUCAS CPR group was 1.84 and in the manual CPR group was 3.21.
  This difference was not significant on the Mann–Whitney U-test ($P = 0.096$)

Menzies D, Barton D, Nolan N.
Does the LUCAS device result in increased injury during CPR?
Abstracts / Resuscitation 81S (2010) AS076
France: 4868 OHCA patients (January 2005 to April 2010)

285 patients (6%) (212 males [74%], 73 females [26%]; median age, 56 [43-70] years).

Results
• time to apply device, 30 seconds (20-60); ease of application and activation, 5 (4-5) and 5 (5-5), respectively;
• duration of use, 30 (20-41) minutes;
• return to spontaneous circulation (ROSC), 76 patients (27%); and time to ROSC, 19 (12-32) minutes after placement.

Lapostolle F. and all.
Out-of-hospital use of an automated chest compression device: facilitating access to extracorporeal life support or non–heart-beating organ procurement
### Table 3

**Technical incidents and clinical complications associated with device use**

<table>
<thead>
<tr>
<th>Technical incidents</th>
<th>n</th>
<th>Clinical complications</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Board</td>
<td></td>
<td>Skin erosion</td>
<td>4</td>
</tr>
<tr>
<td>Placed upside down</td>
<td>2</td>
<td>Chest/abdominal wall hematoma</td>
<td>5</td>
</tr>
<tr>
<td>Battery</td>
<td></td>
<td>Subcutaneous emphysema</td>
<td>1</td>
</tr>
<tr>
<td>Became loose</td>
<td>2</td>
<td>Hemoptysis</td>
<td>5</td>
</tr>
<tr>
<td>Strap</td>
<td></td>
<td>Hemothorax a</td>
<td>1</td>
</tr>
<tr>
<td>Charge fault</td>
<td>3</td>
<td>Hematemesis</td>
<td>2</td>
</tr>
<tr>
<td>Clothes caught in strap</td>
<td>1</td>
<td>Pneumomediastinum a</td>
<td>1</td>
</tr>
<tr>
<td>Too short, set off alarm</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Jammed</td>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Faulty catch</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Function</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Board stopped (no error message)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Error message</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total, n (%)</td>
<td>21</td>
<td>Total, n (%)</td>
<td>19</td>
</tr>
<tr>
<td>(7)</td>
<td></td>
<td>(7)</td>
<td></td>
</tr>
</tbody>
</table>

*a* Diagnosed on arrival at hospital.

Lapostolle F. and all.

Out-of-hospital use of an automated chest compression device: facilitating access to extracorporeal life support or non–heart-beating organ procurement

L’arbitrage

Circulation Improving Resuscitation Care (CIRC)
Effectifs estimés: 5000
Date de début de l'étude: January 2008
Date d'achèvement prévue étude: November 2012

A Randomized Controlled Study Comparing Autopulse To Manual CPR In A CPR-First Protocol For Out-Of-Hospital Cardiac Arrest (OHCA)

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

ACR → MCE + IOT (BOUSSIGNAC ?) → CRITERES MCE PROLONGE ? → MISE EN PLACE MCE-A PAR EQUIPE ENTRAINEE → TRANSPORT
  • BLOC
  • CORO
  • ECMO
  • ...

Dr CAILLOCE – SAMU 87  Journée ALIADE 2010  22 / 25
Ne pas oublier l’essentiel !!

Figure 1
AHA ECC Adult Chain of Survival

The links in the new AHA ECC Adult Chain of Survival are as follows:

1. Immediate recognition of cardiac arrest and activation of the emergency response system
2. Early CPR with an emphasis on chest compressions
3. Rapid defibrillation
4. Effective advanced life support
5. Integrated post-cardiac arrest care
Ne pas oublier l’essentiel !!

Dr CAILLOCE – SAMU 87  Journée ALIADE 2010
Un seul vainqueur
le patient