The use of LUCAS and the Boussignac tube in the pre-hospital setting

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Introduction

The Lund University Cardiac Arrest System (LUCAS) is a gas-driven sternal compression device that enables delivery of continuous compressions during transport and defibrillation. Controversy still exists as to use the LUCAS chest compression system together with the Boussignac endotracheal tube during cardiopulmonary resuscitation (CPR) in the pre-hospital setting. Until today, there are still insufficient data to generalise this method for resuscitation. This observational study is aimed to examine if this type of CPR in the pre-hospital setting is beneficial when prolonged CPR is needed.

Methods and Materials

All pre-hospital care workers were thoroughly trained in using the LUCAS (Figure 1). The paramedics and emergency physicians were also trained to intubate the patient with the Boussignac tube (Figure 2). A total of 48 patients with cardiac arrest was included in this study. After applying the BLS-AED ERC protocol (Figure 3 and 4), the LUCAS and in most cases (n = 38), the Boussignac tube was placed. This permitted continuous hands free CPR and patients could be transported to the emergency department and to the cathlab (Figure 5) if indicated. Even during rescue PCI, the LUCAS-Boussignac concept was operational. The following parameters were determined in all patients: age, sex, time before first defibrillation, time before first ETT, time to connect LUCAS, initial heart rythm, survival, presence of pink sputum, ROSC, heart rythm, blood pressure.

Figure 1: the Lund University Cardiac Arrest System (LUCAS)

Figure 2: Boussignac tube

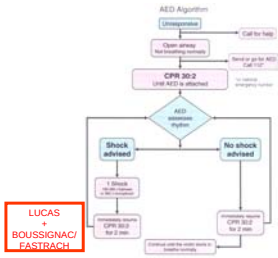

Figure 3: Algorithm for CPR with reanimating witness

Figure 4: Algorithm for CPR without reanimating witness

Figure 5: LUCAS-Boussignac in the ca

Results and Discussion

Of the 48 patients, 38 (79.2%) were intubated with the Boussignac tube. The median intervention time of the MICU was 10.7 minutes. Ten (20.8%) patients were in ventricular fibrillation (VF), 29 (60%) patients were in asystole and 6 (12.5%) patients were in PEA. Restoration of spontaneous cardiac output (ROSC) was achieved in 18 (37.5%) patients. Of those, 7 were admitted to the ICU, 4 (8.3%; 3 VF, 1 asystole) of those are in CPC 1, and 3 (6.2%; 2 VF, 1 asystole) are in CPC 2.

Overview of data for patients intubated with the Boussignac tube (n = 38) and patients not intubated with the Boussignac tube (n = 10) are shown in Table 1. In the patients intubated with the Boussignac tube, ROSC was achieved in 17 patients (44.7%), while ROSC was obtained in only 1 patient (10.0%) who was not intubated with the Boussignac tube. As a consequence, the survival rate in the Boussignac intubated group was higher than in the non-Boussignac intubated group of patients [26.3% (n = 10) compared to 10.0% (n = 1), respectively]. Due to the small sample size, especially of the non-Boussignac intubated group, statistical analysis (logistic regression and analysis of correlation) did not show any significant difference between the 2 subgroups in this study.

Table 1: Overview of the data collected for patients intubated with Boussignac tube and non-intubated with Boussignac tube

Parameter	All patients	%	Boussignac	%	Non-Boussignac	%
n	48	100%	38	79%	10	21%
age (years)	71.4 ± 13.2	NA	72.4 ± 12.5	NA	67.4 ± 15.5	NA
male	27	56.3%	20	52.6%	7	70.0%
female	21	43.8%	18	47.4%	3	30.0%
time 1st defib (min)	5.7 ± 4.4	NA	4.6 ± 3.8	NA	9.5 ± 4.9	NA
time first ett (min)	3.0 ± 4.0	NA	3.2 ± 4.4	NA	2.4 ± 1.4	NA
Boussignac	38	79.2%	38	100%	0	0.0%
ROSC	18	37.5%	17	44.7%	1	10.0%
time connection LUCAS (sec)	114.7 ± 63.7	NA	102.9 ± 47.2	NA	156.0 ± 94.7	NA
initial rythm VT	1	2.08%	1	2.6%	0	0.0%
VF	10	20.8%	10	26.3%	0	0.0%
asystole	29	60.4%	22	57.9%	7	70.0%
brady-asystole	2	4.2%	1	2.6%	1	10.0%
PEA	6	12.5%	4	10.5%	2	20.0%
heart rythm	17	35.4%	15	39.5%	2	20.0%
blood pressure	16	33.3%	15	39.5%	1	10.0%
consciousness	2	4.2%	2	5.3%	0	0.0%
survival	11	22.9%	10	26.3%	1	10.0%
pink sputum	4	8.3%	4	10.5%	0	0.0%

Conclusions

As our hospital is located in a rural area, the implementation of the LUCAS and the Boussignac tube in the ambulance improves the success rate of resuscitation. The fully handsfree CPR is accepted with great enthusiasm by all pre-hospital care workers and we believe it is particularly useful when prolonged CPR is required. However, due to the limited number of patients included in this study, a clinical study containing more patients and more groups would be recommended in order to obtain statistical confirmation of the better outcome of the combination LUCAS-Boussignac.