ORIGINAL ARTICLE

Performance of single or paired rescuers or teams of two using a mechanical resuscitation device on manikis: a comparative cohort study

Henrik FISCHER[1], **Dominik STUMPF**[2], **Stephanie NEUHOLD**[1], **Sophie FRANTAL**[3], **Kurt RÜTZLER**[1], **Harald RINÖSL**[1], **Eva HOCHBRUGGER**[4], **Lorenz THEILER**[5], **Robert GREIF**[5]

[1]Department of Anaesthesia, General Intensive Care and Pain Medicine, Division of Cardio-Thoracic-Vascular Surgical Anaesthesia and Intensive Care Medicine, Medical University of Vienna, Austria. [2]AUVA Trauma Hospital, Linz, Austria. [3]Center for Medical Statistics, Informatics and Intelligent Systems, Medical University Vienna, Austria. [4]Department of Internal Medicine III, Division of Endocrinology and Metabolism, Medical University of Vienna, Austria. [5]Department of Anaesthesiology and Pain Therapy, Bern University Hospital and University of Bern, Switzerland.

Correspondence:
Henrik Fischer
Department of Anaesthesia, General Intensive Care and Pain Control, Division of Cardio-Thoracic-Vascular Anaesthesia and Intensive Care Medicine, Medical University of Vienna, Austria Waehringer Guertel 18-20, 1090 Vienna, Austria
E-mail: henrik.fischer@meduniwien.ac.at

Received:
28-8-2012

Accepted:
9-11-2012

Conflict of interest:
The authors declare no conflict of interest in relation to the present article.

Acknowledgements:
We thank Emily Lemon and Jeff Crowder for the English proofreading.

Purpose: To compare the efficiency of the Animax handpowered mechanical resuscitation device (MRD) for cardiopulmonary resuscitation during use by a single rescuer or paired rescuers working on manikins. The basis for comparison was a new parameter, the effective compression ratio (ECR).
Methods: This was a comparative cohort study of data from prior studies that were entered into a spreadsheet (Excel) for analysis with a macro. The ECR, which integrates parameters that are relevant to effective resuscitation, was compared between the 2 cohorts.
Results: Single rescuers achieved a higher mean (SD) ECR (0.57 [0.3] vs 0.32 [0.3] for the paired rescuers, $P < .001$) but their ECR declined more rapidly (by 2.2% vs 1.1% per minute, $P = .01$) and they had less compression depth (41.8 mm [3.7] vs 46.2 mm [6.9 mm] for the paired rescuers, $P < .001$). The ECR decreased 0.01 (2.3%) per minute in the single-rescuer cohort and 0.004 (1.1%) per minute in the paired-rescuer cohort ($P = .01$).
Conclusions: The Animax mechanical resuscitation device was superior when used by a single rescuer than when used by paired rescuers, based on the integrated ECR parameter. Although the decline in the ECR when the MRD was used by the single rescuers was more pronounced within the first 3 minutes, overall they achieved a higher ECR. Before this MRD is used more widely, clinical studies are needed to test the device's safety and efficacy in patients. [Emergencias 2013;25:278-284]

Keywords: Basic life support. Mechanical resuscitation device. Effective compression ratio.

Introduction

Correctly performed basic life support (BLS) can double the chances of surviving cardiac arrest[1-3]. However, clinical studies demonstrate that the efficiency of single rescuers massively deteriorates after the first three minutes[4-6]. Mechanical resuscitation devices (MRD) were developed with the intent of providing high quality cardio pulmonary resuscitation (CPR) over an extended period. Fully automatic MRDs like Autopulse™ (Zoll Medical Corporation, Chelmsford, USA) and Lucas 2™ (Physiocontrol, Redmond, WA, USA) rely on an external power source, which limits their use. The MRD Animax™ (AAT Alber Antriebstechnik, Ebingen, Germany) is hand-powered by a single rescuer and therefore independent of an external power source.

Two studies investigated the efficiency of this MRD in manikins, comparing it to standard BLS both in a single and a two rescuer scenario[7,8]. Single rescuers using the MRD resulted in less hands-off time and more effective compressions (ECs) compared to standard BLS; two rescuers using the MRD resulted in even less hands-off time compared to two-rescuer standard BLS[7,8]. Because studies that investigated standard BLS in different settings found that two-rescuer resuscitation is more effective than resuscitation by a single rescuer[9,10], we wanted to analyse the quality of resuscitation if the MRD is used by single rescuers compared to two rescuers.

Methods

We studied differences in the quality of resuscitation in the two MRD cohorts and used prospectively collected data for this post hoc analysis[7,8]. These studies had already been approved by the ethics committee of the Medical University Vienna. Results regarding the MRD were extracted from the data sets in order to compare the two cohorts. At the same time, data from the standard BLS groups served as a control to document the comparability of the cohorts.

The single rescuer cohort consisted of 91 participants, the two-rescuer cohort of 40 teams of two. The single rescuer cohort was comprised of third-year medical students from the Medical University Vienna; the two-rescuer cohort was made up of flight attendants from Austrian Airlines. In each cohort the initial method – BLS or use of the MRD – was randomised, and participants had to rest for thirty minutes between tests to avoid fatigue. All participants were trained in the same way in standard BLS and the use of the MRD, and they had to pass the competence test[7,8]. All test stations used the manikin Ambu®Man C (Ambu, Ballerup, Denmark). One resuscitation study period lasted 12 minutes.

BLS was performed according to the 2005 European Resuscitation Council (ERC) guidelines[11]. It is worth noting that while the mode and workflow of resuscitation has not been changed for the current guidelines, the targets regarding compression depth and rate have been slightly modified. For chest compressions the participants were positioned at the side of the manikin's chest to provide ventilation at the side of the head. The two-rescuer teams changed positions every two minutes. To provide ventilation, a size four facemask (Ambu® Silicon facemask size 4, Ambu, Ballerup, Denmark) with a self-inflating bag (Ambu® Mark IV Adult, Ambu, Ballerup, Denmark) was used.

The MRD was positioned, as recommended by the manufacturer, on the manikin as already described in detail[7,8]. Two scoop feeds have to be pushed under the victim and a pressure stamp lowered to the victim's chest. Compression depth is adjusted automatically by means of an adjustment pin. Ventilation is achieved with an integrated spiro-set. A facemask is attached with straps to a neck pillow placed under the victim's neck to ensure that the neck is hyper-extended. The current airway pressure, which according to the manufacturer should be 15 mm H_2O, can be read on the pressure manometer. The rescuer should push the lever of the device at a rate of 100 $min.^{-1}$ The device switches automatically after 30 chest compressions to execute two ventilations. The resistance to the lever increases during ventilation; therefore ventilations are performed at a much slower rate. Two rescuers do not have to change positions to alternate tasks, as the lever can be pivoted (Figure 1).

Data was recorded using the Ambu® CPR Software™ (Version 2.3.9, Ambu, Ballerup, Denmark), and an Excel® macro was designed specifically for the analysis using Visual Basic (Visual Basic 6.3, Excel 2003, Microsoft Corporation, Redmond, WA, USA). The Excel® macro read the raw data that the manikin had measured, detecting chest

Figure 1. Manikin with the MRD "Animax"®.

compressions and ventilation, and processed the data. The processing of the haemodynamic data was done in 15-second fragments, ventilation in one-minute fragments. A chest compression was recognised when 10 mm compression depth was exceeded. A ventilation was recorded if at least 50 ml were inflated.

ECR was calculated by multiplying "flow time (FT)" and "effective compressions". We considered 0.79 as the target value for optimal chest compression. This value is based on current 2010 ERC guidelines[12]: Five complete cycles of 30 compressions, 2 ventilations should last two minutes. This is a total of ten ventilations. According to the guidelines, two ventilations should not take longer than five seconds. Therefore, the time allocated to ventilation in the two-minute resuscitation cycle should not be more than 25 seconds, or 12.5 seconds in one minute. Therefore, the time allocated to compression (FT) in one minute is 47.5 seconds or 79.2% (or rounded to 79% flow-time and 21% no-flow time). Consequently, the optimal ECR would be the product of 100% ECs and a FT of 0.79 (ECR= 1.0 x 0.79 = 0.79)[13].

Flow time: FT was the period during which any kind of chest compressions were performed. One compression cycle was judged as completed if no further chest compression was detected during 1.5 seconds following the last compression.

Effective compression: A chest compression was recorded as effective if the position of the hands, the compression depth and the decompression were correct as previously described in detail[7,8].

Parameters regarding haemodynamics were compression depth, compression rate, EC and no-flow time, for ventilation, ventilation time, tidal volume and minute volume. The time required to set up the device was also compared.

Results are stated as mean ± standard deviation or frequencies and percentages. The two cohorts (single vs. two rescuers) and a combination of cohort and rescuers (MRD single vs. BLS two rescuers) were compared with independent two-sided t tests for metric and Chi^2 test for categorical variables. ECR of the different cohorts was compared using a linear mixed effects model with the study participants being the random variable. Additionally, to consider the comparability of the two cohorts and thus see a possible influence of gender, age, weight and size on ECR and minute volume, we used descriptive analyses. P-values of less than 0.05 were considered statistically significant. R Foundation for Statistical Computing (R 2.1.12, R development core team, Vienna, Austria), SPSS (SPSS 11.5, Chicago, IL, USA) and Excel® 2003 (Microsoft Corporation, Redmond, WA, USA) were used for the analyses.

Results

Demographics of the two cohorts are shown in Table 1. In every group we lost one data set due to technical difficulties. Figure 2 shows the sequence of the testing.

The cohort of single rescuers achieved an ECR of 0.57 ± 0.3, the cohort of two-rescuers 0.32 ± 0.3. This was significantly less (p < 0.001, Table 2). The ECR decreased by 0.01 (2.2%) in the single rescuer cohort and 0.004 (1.1%) in the two-rescuer cohort per minute (p = 0.01) (Figure 3).

Haemodynamics. The single rescuer cohort achieved significantly less compression depth (41.8 ± 3.7 mm vs. 46.2 ± 6.9 mm, p < 0.001) but relatively more ECs (66 ± 34 % vs. 38 ± 35 %, p < 0.001). There was no statistically significant difference regarding compression rate and no-flow time (Table 2).

Ventilation. The single-rescuer cohort achieved a significantly higher tidal volume (360 ± 90 ml vs. 330 ± 80 ml, p = 0.037). There was no difference regarding minute volume and ventilation time (Table 2). The single rescuer cohort needed significantly more time to set up the MRD and to start chest compressions (48 ± 12 sec vs. 36 ± 14 sec, p < 0.001).

The cohort of single rescuers achieved an ECR of 0.25 ± 0.2, the cohort of two rescuers 0.3 ± 0.2, p = 0.22 (Table 3).

The cohort of single MRD rescuers achieved an ECR of 0.57 ± 0.3 compared to the cohort of two rescuers BLS 0.3 ± 0.2, p < 0.001 (Table 4). The ECR decreased by 0.01 (2.3%) in the single rescuer MRD cohort, but in the two-rescuer BLS cohort per minute only by 0.006 (1.9%) (p = 0.05).

Since the two cohorts differed significantly regarding age and gender because of the different settings (medical students and flight attendants), we studied the influence of the demographic fac-

Table 1. Demographics of participants

	Single rescuer	Two rescuers	p-value
Number of participants [n]	80	78 (39 teams)	–
Gender [women%]	50	83	< 0.001
Age [years]*	23 ± 3	34 ± 7	< 0.001
Body mass index [kg/m^2]*	22 ± 3	21 ± 3	0.76

*Data are presented as mean ± SD and compared using an unpaired t-test, except for gender where a χ^2-test was used.

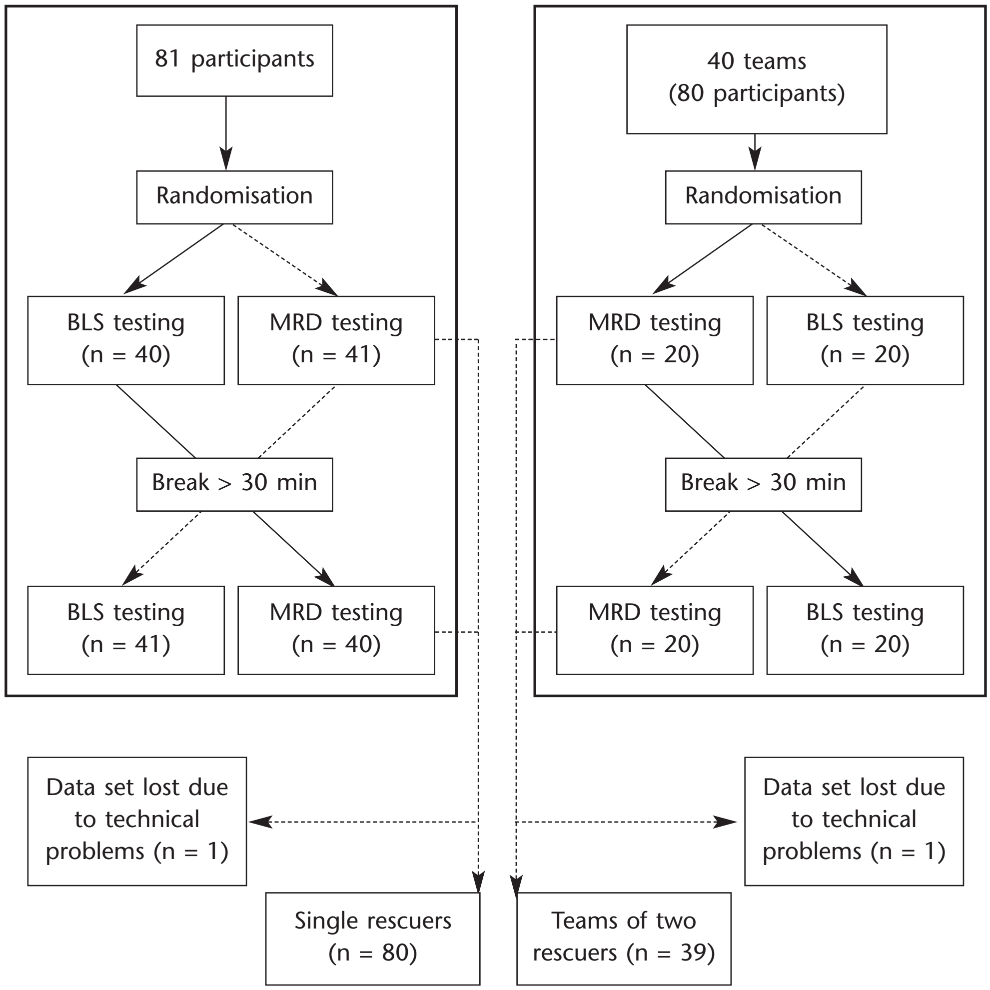

Figure 2. Flow-chart participants.

tors on ECR and minute volume in the two standard BLS groups. We found no difference regarding age (ECR: R^2 = 0.0006, minute volume: R^2 = 0.05), weight (ECR: R^2 = 0.006, minute volume: R^2 = 0.05), height (ECR: R^2 = 0.02, minute volume: R^2 = 0.006), or gender (ECR: male vs. female 0.25 ± 0.19% vs. 0.26 ± 0.2%; minute volume: 1940 ± 959 ml vs. 2028 ± 1014 ml).

Table 2. MRD Results

	Single rescuer	Two rescuers	p-value
Effective compression ratio*	0.57 ± 0.3	0.32 ± 0.3	< 0.001
Compression depth [mm]	41.8 ± 3.7	46.2 ± 6.9	< 0.001
Compression rate [Comp/min]	87 ± 10	91 ± 15	0.086
Effective compressions [%]**	66 ± 34	38 ± 35	< 0.001
Ventilation time [sec/min]	5.3 ± 1.7	5.1 ± 2	0.689
No-flow time [sec/min]	11.6 ± 3.9	10.5 ± 3.5	0.078
Tidal volume [ml]	360 ± 90	330 ± 80	0.037
Minute volume [ml]	1,860 ± 660	1,700 ± 710	0.232
Assembly time [sec]	48 ± 12	36 ± 14	< 0.001

Data are presented as mean ± SD and compared using an unpaired t-test. *Effective compression ratio (ECR) was calculated by multiplying "effective compressions" and "flow time". **A chest compression was recorded as "effective compression" if the hand position, the compression depth and the decompression were correct.

Discussion

The aim of our study was to compare the quality of resuscitation performed according to ERC guidelines[9] using an MRD and the new parameter "effective compression ratio" in a single rescuer or two-rescuer setting. Surprisingly, the two-rescuer teams achieved significantly less ECR compared to the single rescuers. ECR is a new parameter that we have introduced for this study that encompasses the most relevant parameters of chest compressions and therefore mirrors the efficiency of chest compressions.

The main reason why the two rescuers achieved significantly less ECR is mainly due to the fact that they performed significantly less ECs.

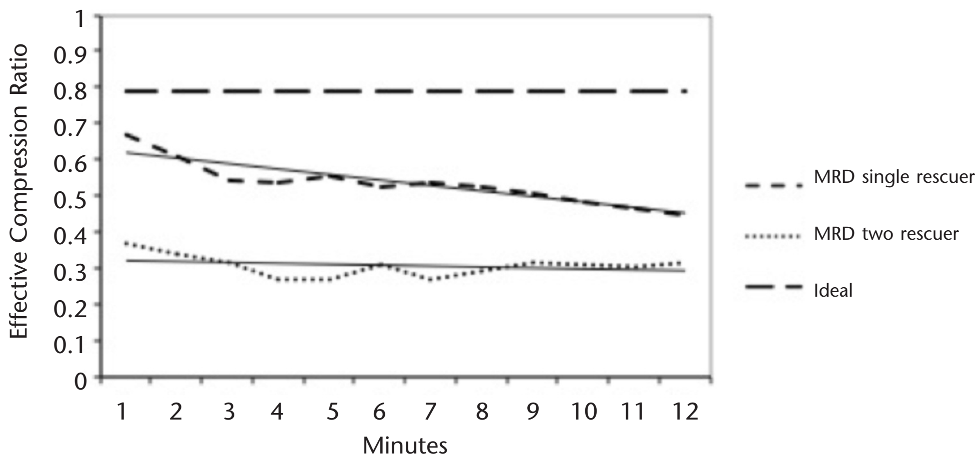

Figure 3. Evolution of the "Effective Compression Ratio (ECR)" over time – MRD.

In most cases this was related to the wrong pressure point on the manikin's chest. This could be due to the design of the device. The two scoop feeds do not optimally protect the device from sliding and tilting, a phenomenon also know from other MRDs[14]. It is likely that the pivoting of the lever between the two rescuers led to more tilting and sliding of the pressure stamp compared to the lever being used mainly in the same position by a single rescuer. This increased instability was quite probably the reason for the low number of ECs in the two-rescuer group. An advantage of the device was less no-flow time in both MRD groups compared to standard BLS. Less no-flow time is solidly linked to a better outcome[15-17]. This is due to the rescuer not having to change position when alternating between chest compressions and ventilations.

In both cohorts the low tidal and minute volumes are notable, a fact that we have described before[7,8]. In the meantime the manufacturer has launched "animax mono", which only does compressions and is targeted at semi-professional or professional rescuers.

According to the literature, standard BLS shows a drastic decline in the quality of resuscitation after three minutes[5]. MRDs were developed to sustain high quality chest compressions over an extended period. The MRD tested in our study did not sufficiently satisfy this goal, as seen in the evolution of ECR over time. Single rescuers started compressions at an acceptable quality level, but show a drastic decline over the first three minutes. However, single rescuers still performed better overall than two rescuers.

As summarized in Table 4, indeed single rescuer were more efficient using the MRD than two rescuers applying standard BLS measured by the ECR (0.57 ± 0.3 vs. 0.3 ± 0.2, $p < 0.001$), and the ECR decreased by 2.3% in the single rescuer MRD cohort, compared to 1.9% in the two-rescuer BLS cohort per minute ($p = 0.05$).

A major problem comparing the use of the MRD and standard BLS is the time that is spent to

Table 3. BLS Results

	Single rescuer	Two rescuers	p-value
Effective compression ratio*	0.25 ± 0.2	0.3 ± 0.2	0.22
Compression depth [mm]	42.3 ± 7.9	43.7 ± 6.4	0.33
Compression rate [Comp/min]	107 ± 12	106 ± 12	0.6
Effective compressions [%]**	41.2 ± 33.5	35.9 ± 22.9	0.37
Ventilation time [sec/min]	4.1 ± 1.4	6.4 ± 2.1	< 0.001
No-flow time [sec/min]	24.7 ± 3.0	13.2 ± 3.5	< 0.001
Tidal volume [ml]	410 ± 130	460 ± 130	0.02
Minute volume [ml]	1,630 ± 720	2,740 ± 1,050	< 0.001

Data are presented as mean ± SD and compared using an unpaired t-test. *Effective compression ratio (ECR) was calculated by multiplying "effective compressions" and "flow time". **A chest compression was recorded as "effective compression" if the hand position, the compression depth and the decompression were correct.

Table 4. BLS two rescuers vs. MRD single rescuer Results

	Single rescuer	Two rescuers	p-value
Effective compression ratio*	0.3 ± 0.2	0.57 ± 0.3	< 0.001
Compression depth [mm]	43.7 ± 6.4	41.8 ± 3.7	0.09
Compression rate [Comp/min]	106 ± 12	87 ± 10	< 0.001
Effective compressions [%]**	35.9 ± 22.9	66 ± 34	< 0.001
Ventilation time [sec/min]	6.4 ± 2.1	5.3 ± 1.7	0.01
No-flow time [sec/min]	13.2 ± 3.5	11.6 ± 3.9	0.02
Tidal volume [ml]	460 ± 130	360 ± 90	< 0.001
Minute volume [ml]	2,740 ± 105	1,860 ± 660	< 0.001

Data are presented as mean ± SD and compared using an unpaired t-test. *Effective compression ratio (ECR) was calculated by multiplying "effective compressions" and "flow time". **A chest compression was recorded as "effective compression" if the hand position, the compression depth and the decompression were correct.

assemble and to align the MRD at the start phase of CPR. Important time necessary to convert cardiac arrest into ROSC might be lost with the MRD.

Since the MRD is manually powered, one rescuer is constantly tied to the device. Fully automatic MRDs do not have this disadvantage. Another important aspect is the set-up time of the device: The manufacturer claims that the set-up takes 23 seconds (20 seconds for preparation and three seconds to position the device on the patient). Participants in our studies needed 48 ± 12 seconds (single-rescuer) or 36 ± 14 seconds (two-rescuers) ($p < 0.001$). During this time no chest compressions are possible, which is another important disadvantage, since several studies have shown that the time between cardiac arrest and the start of BLS is directly related to survival[1-3].

We examined two cohorts using an almost identical study design. There were relevant differences regarding gender and age, but we did not find any influence of these parameters on ECR or minute volume. This is in accordance with prior studies that showed that quality of chest compressions is independent from the rescuer's gender[5].

ECR and minute volume of the two cohorts that did standard BLS achieved values comparable to prior studies[9,14,19-22] and comparing these two groups, we found no difference regarding ECR (Table 3). Interestingly, we found that the two rescuers achieved significantly less no-flow time compared to the single rescuers, but the two groups did not differ regarding ECs (Table 3).

The strength of our study is the detailed analysis of haemodynamic and ventilatory parameters, which is impossible using the standard software. The time-dependent analysis was possible using a special Excel® macro, which did a beat-to-beat analysis and is able to collect and calculate many more parameters. The detailed description of the use of the macro and its application to calculate ECR is described elsewhere[13].

The new parameter ECR that we introduced encompasses the most relevant measurements that describe chest compression and distils them into a single number. This product of the percentages of ECs and FT can range between 0, if there is no chest compression and 1 during compression-only CPR. Since the guidelines recommend that ventilation should take five seconds, an optimal ECR would be 0.79. In our study, neither using an MRD as a single rescuer nor working in a team of two rescuers came close to attaining this index number. We believe that ECR is an interesting parameter, since it made it possible to directly compare complex haemodynamic parameters with one characteristic in different resuscitation studies for the first time.

The results of this study on manikins cannot necessarily be extrapolated to humans in cardiac arrest. The manufacturers of the MRD claim that the device slides more readily on a manikin compared to humans due to the manikin's back being flatter, resulting in more misplaced compressions. In the absence of any study on humans, we cannot comment on this.

In conclusion, the MRD Animax™ was superior regarding the new parameter ECR in a single rescuer setting compared to two rescuers and compared to standard BLS. ECR decreased substantially during the first three minutes, when single rescuers used the MRD. However, single rescuers performed better than two rescuers overall. Despite the set-up time of the device that delayed the start of chest compressions compared to standard BLS, use of the MRD resulted in less no-flow time compared to standard BLS both in the single and the two-rescuer setting. Before this MRD becomes used more widely, the device should be tested on animals and humans to determine its safety, efficiency and potential harm to the patients compared to other MRDs and BLS.

References

1 Valenzuela TD, Roe DJ, Cretin S, Spaite DW, Larsen MP. Estimating effectiveness of cardiac arrest interventions: a logistic regression survival model. Circulation. 1997;96:3308-13.
2 Larsen MP, Eisenberg MS, Cummins RO, Hallstrom AP. Predicting survival from out-of-hospital cardiac arrest: a graphic model. Ann Emerg Med. 1993;22:1652-8.
3 Larsen MP, Eisenberg MS, Cummins RO, Hallstrom AP. Predicting survival from out-of-hospital cardiac arrest: a graphic model. Resuscitation. 2000;47:59-70.
4 Hightower D, Thomas SH, Stone CK, Dunn K, March JA. Decay in quality of closed-chest compressions over time. Ann Emerg Med. 1995;26:300-3.
5 Ochoa FJ, Ramalle-Gomara E, Lisa V, Saralegui I. The effect of rescuer fatigue on the quality of chest compressions. Resuscitation. 1998;37:149-52.
6 Perkins GD, Augre C, Rogers H, Allan M, Thickett DR. CPREzy: an evaluation during simulated cardiac arrest on a hospital bed. Resuscitation. 2005;64:103-8.
7 Fischer H, Neuhold S, Zapletal B, Hochbrugger E, Koinig H, Steinlechner B, et al. A manually powered mechanical resuscitation device used by a single rescuer: A randomised controlled manikin study. Resuscitation. 2011;82:913-9.
8 Fischer H, Neuhold S, Hochbrugger E, Steinlechner B, Koinig H, Milosevic L, et al. Quality of resuscitation: flight attendants in an airplane simulator use a new mechanical resuscitation device--a randomised simulation study. Resuscitation. 2011;82:459-63.
9 Fallaha JF, Spooner BB, Perkins GD. Does Dual Operator CPR help minimize interruptions in chest compressions? Resuscitation. 2009;80:1011-4.
10 Handley AJ, Handley JA. Performing chest compressions in a confined space. Resuscitation. 2004;61:55-61.
11 Handley AJ, Koster R, Monsieurs K, Perkins GD, Davies S, Bossaert L. European Resuscitation Council guidelines for resuscitation 2005. Section 2. Adult basic life support and use of automated external defibrillators. Resuscitation. 2005;67(Supl 1):S7-23.

12 Koster RW, Baubin MA, Bossaert LL, Caballero A, Cassan P, Castrén M, et al. European Resuscitation Council Guidelines for Resuscitation 2010 Section 2. Adult basic life support and use of automated external defibrillators. Resuscitation. 2010;81:1277-92.
13 Greif R, Stumpf D, Neuhold S, Rützler K, Theiler L, Hochbrugger E, et al. Effective compression ratio – a new Measurement of the Quality of Thorax Compression during CPR. Resuscitation 2013: en prensa.
14 Blomberg H, Gedeborg R, Berglund L, Karlsten R, Johansson J. Poor chest compression quality with mechanical compressions in simulated cardiopulmonary resuscitation: A randomized, cross-over manikin study. Resuscitation. 2011;82:1332-7.
15 Berg RA, Sanders AB, Kern KB, Hilwig RW, Heidenreich JW, Porter ME, et al. Adverse hemodynamic effects of interrupting chest compressions for rescue breathing during cardiopulmonary resuscitation for ventricular fibrillation cardiac arrest. Circulation. 2001;104:2465-70.
16 Christenson J, Andrusiek D, Everson-Stewart S, Kudenchuk P, Hostler D, Powell J, et al. Chest compression fraction determines survival in patients with out-of-hospital ventricular fibrillation. Circulation. 2009;120:1241-7.
17 Ewy GA, Zuercher M, Hilwig RW, Sanders AB, Berg RA, Otto CW, et al. Improved neurological outcome with continuous chest compressions compared with 30:2 compressions-to-ventilations cardiopulmonary resuscitation in a realistic swine model of out-of-hospital cardiac arrest. Circulation. 2007;116:2525-30.
18 Lebherz H. HvO-Gruppe im Einsatz mit mechanischem Reanimationsgerät. Im Einsatz. 2008;15:42-3.
19 Lukas RP, Sengelhoff C, Döpker S, Harding U, Mertens P, Osada N, et al. Chest compression quality: Can feedback technology help? Anaesthesist. 2010;59:135-9.
20 Wik L, Kramer-Johansen J, Myklebust H, Sørebø H, Svensson L, Fellows B, et al. Quality of cardiopulmonary resuscitation during out-of-hospital cardiac arrest. JAMA. 2005;293:299-304.
21 Kramer-Johansen J, Myklebust H, Wik L, Fellows B, Svensson L, Sørebø H, et al. Quality of out-of-hospital cardiopulmonary resuscitation with real time automated feedback: a prospective interventional study. Resuscitation. 2006;71:283-92.
22 Tomte O, Sunde K, Lorem T, Auestad B, Souders C, Jensen J, et al. Advanced life support performance with manual and mechanical chest compressions in a randomized, multicentre manikin study. Resuscitation. 2009;80:1152-7.

Estudio comparativo con maniquís entre uno o dos rescatadores usando un dispositivo de resucitación mecánico

Fischer H, Stumpf D, Neuhold S, Frantal S, Rützler K, Rinösl H, Hochbrugger E, Theiler L, Greif R

Objetivo: Comparar la eficacia del dispositivo mecánico de reanimación (DMR) Animax (dispositivo con accionamiento manual de resucitación cardiopulmonar) basado en el nuevo parámetro de relación de compresión efectiva. Hemos analizado las diferencias cuando este DMR lo usan uno o por dos socorristas en maniquís.
Método: Se realizó un estudio de cohorte comparativo. Los datos de estudios anteriores se analizaron y compararon utilizando Excel macro. Para comparar la calidad de la reanimación, se introdujo el parámetro de relación de compresión efectiva (RCE) que integra parámetros relevantes para una resucitación eficaz.
Resultados: Un solo rescatador logró una mayor RCE (0,57 ± 0,3 *vs* 0,32 ± 0,3, p < 0,001), pero con un descenso más rápido de la misma (2,2% frente a 1,1% por minuto, p = 0,01) y menos profundidad de compresión (41,8 ± 3,7 *vs* 46,2 ± 6,9 mm, p < 0,001). La RCE disminuye 0,01 (2,3%) en la cohorte de rescatador único y 0,004 (1,1%) en la cohorte de dos rescatadores (p = 0,01).
Conclusión: En el dispositivo Animax®, el parámetro RCE es mejor con un rescatador que con dos. En comparación, la disminución de la RCE en los rescatadores individuales fue más pronunciada en los primeros tres minutos. Antes de usar este dispositivo son precisos estudios clínicos de seguridad y eficacia en los pacientes. [Emergencias 2013;25:278-284]

Palabras clave: Soporte vital básico. Dispositivo de resucitación mecánica. Relación compresión efectiva.