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CPREzy™ improves performance of external chest compressions in simulated cardiac arrest☆

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Summary
Aim of the study: External chest compression (ECC) is an essential part of cardiopulmonary resuscitation and usually performed without any adjuncts. Although different supportive devices have been developed, none have yet been implemented as a standard procedure to guide rescuers in resuscitation. This study investigates the effects of the CPREzy™-pad on ECC performed by first year medical students during simulated cardiac arrest.
Materials and methods: Two hundred and two subjects were randomised and asked to perform 5 min of single-rescuer-CPR. Group 1 ($n = 111$) was taught classic ECC, followed by ECC with the CPREzy™ and was tested in ECC with the CPREzy™. Group 2 ($n = 91$) was taught and tested in classic ECC only. One week later each group was divided: Group 1A was tested in ECC with the CPREzy™ again; Group 1B was tested in classic ECC. Group 2A was taught and tested in ECC with CPREzy™; Group 2B was tested in classic ECC again. Primary endpoints were compression rate (90—110/min) and compression depth (40—50 mm).
Results: Comparing groups 1 and 2, ECC was significantly superior with CPREzy™ (correct rate: 93.7% versus 19.8%, $p \leq 0.01$; depth: 71.2% versus 34.1%, $p \leq 0.01$). The group tested with CPREzy™ initially 1 week later (2A; $n = 36$) improved significantly in correct compression rate (19.8% versus 88.9%, $p \leq 0.01$) and compression depth

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(34.1% versus 75.0%, $p \leq 0.02$). The control-group (2B; $n = 55$) without CPREzy™ demonstrated poor performance in both evaluations (correct rate: 19.8% versus 25.5%, depth: 34.1% versus 43.6%).
Conclusion: CPREzy™ as a simple portable and re-usable device is able to improve performance of ECC in simulated cardiac arrest.

Introduction

The initial goal of cardiopulmonary resuscitation (CPR) is to restore an organised, perfusing heart rhythm. External chest compressions (ECC) are a key element of CPR aiming to promote forward blood flow and therefore to maintain heart and brain viability. Even optimally performed manual ECC rarely exceeds 30% of normal vital organ blood flow[1,2] and the haemodynamic effects of ECC are dependent on the compression force,[3] rate[4] and duration.[5] However, the overall importance and haemodynamic significance of consistent, well-performed ECC has recently been reconfirmed by laboratory investigations documenting decreased resuscitability when ECC is interrupted for rescue breathing and rhythm analysis.[6–8]

In contrast, the quality of ECC performed by professional healthcare providers has been called into question, and the performance by laypersons might even be worse.[9,10] The current ILCOR guidelines recommendations[11] cover different facets of ECC performance, summarised in Table 1. Several devices have been developed specifically to support lay rescuers to improve adherence to these recommendations. However, none of these devices has been incorporated into clinical practice.

The CPREzy™-pad (CPREzy™) is an adjunct that has been shown to improve the performance of ECC in two studies with a small number of tested subjects and different study designs. The aim of the present study was to examine if the use of the CPREzy™ is able to improve the quality of ECC in a large population of first year medical students, if effects of training were detectable, and if the device was accepted by the users.

Table 1 Summary of recommendations concerning external chest compressions

Hand positioning	Lower half of the sternum
Compression rate	100/min
Compression depth	40–50 mm
Ratio compression:decompression	1:1 (with complete release during decompression)
Compression–ventilation ratio	30:2

Materials and Methods

Equipment

The CPREzy™ is a re-usable, portable device designed to improve the performance of rescuers delivering ECC during CPR. It consists of a solid plastic exterior shell weighing 260 g. The external dimensions are 55 mm × 180 mm × 50 mm and a 9 V battery is necessary to power the device. A diagram on the lower part of the device indicates where it should be placed on the patient's sternum and where to apply compression force (Figure 1). After turning the device on, a series of lights in the upper part illuminate with each compression, and switch off after releasing pressure adequately. The number of lights activated depends on the force generated by each compression force 23 kg illuminates 1 light and is suitable for a child, 2 lights generate 32 kg suitable for a small adult, 3 lights generate 41 kg suitable for an average adult, 4 lights generate 50 kg suitable for a large adult and 5 lights are equal to 54 kg (caution). The corresponding, approximate, body weights are indicated adjacent

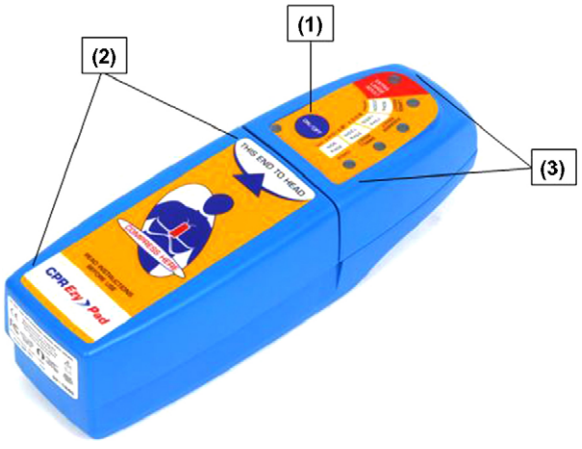

Figure 1 The CPREzy™-pad with the on/off-button (1), the compression surface (2) and the series of lights indicating the amount of compression pressure (3).