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(收稿日期:2018-01-17,修回日期:2019-01-31)

doi:10.3969/j.issn.1009-6469.2019.04.032

◇临床医学◇

救护车上保持施救者身体平衡的固定架 对胸外按压质量影响

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基金项目:河北省沧州市科技支撑计划项目(141302120);北京协和基金会睿E急诊医学研究专项基金(RE2016-013)

摘要:目的 探讨保持救护车上施救者身体平衡的固定架对胸外按压质量的效果,同时评价其对复苏实施者背部疼痛程度的影响。方法 实验模拟40个院前呼吸心跳骤停病人救护车转运的场景,招募的8名胸外按压实施者在救护车转运过程中在模拟人上进行胸外心脏按压,通过心肺复苏反馈系统评价胸外心脏按压质量,同时应用 numerical rating scale 疼痛数字评价量表评价复苏实施者背部疼痛的程度。结果 与未应用平衡固定架组相比,应用平衡架固定架组有较高的有效按压深度比例[(72±4)%比(50±3)%, $t=6.84$, $P<0.01$],较低的按压中断时间比例[(10±3)%比(24±5)%, $t=-11.46$, $P<0.01$]和背部疼痛评分[1.5(1.0)分比3.0(1.0)分, $Z=-3.55$, $P<0.01$]。结论 这种救护车上保持施救者身体平衡的固定架有益于提高胸外心脏按压质量,同时降低复苏实施者背部疼痛的程度。

关键词:心脏停搏; 心脏按摩; 心肺复苏术; 约束,身体的; 姿势平衡

Effects of the fixator with maintaining the body balance of the rescuer for the quality of chest compression on the ambulance

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Abstract: Objective To introduce the effect of the fixator with maintaining the body balance of the rescuer for the quality of chest compression on the ambulance, and to evaluate the severity of back pain. **Methods** The experiment simulated the ambulance transshipment of 40 patients with pre-hospital respiratory arrest, and the recruited 8 chest compression practitioners (CPR) performed chest external cardiac compression on the simulated person during the ambulance transport. The quality of chest compressions was evaluated using cardiopulmonary resuscitation feedback system, and the severity of back pain scored using numerical rating scale were evaluated.

Results Compared with CPR without stabilisation device, CPR with stabilisation device had higher percentage of chest compressions with adequate depth [$(72 \pm 4)\%$ vs. $(50 \pm 3)\%$, $t = 6.84$, $P < 0.01$], lower no-flow fraction [$(10 \pm 3)\%$ vs. $(24 \pm 5)\%$, $t = -11.46$, $P < 0.01$] and lower back pain scored [$1.5 (1.0)$ vs. $3.0 (1.0)$, $Z = -3.55$, $P < 0.01$]. **Conclusion** CPR with stabilisation device during ambulance transport could effectively improve quality of cardiopulmonary resuscitation and reduce the severity of back pain.

Key words: Heart arrest; Heart massage; Cardiopulmonary resuscitation; Restraint, physical; Postural balance

提高院前心脏骤停病人心肺复苏的成功率是医务人员的一项挑战。影响院前心肺复苏质量的因素很多,包括胸外心脏按压的质量^[1],有效的电除颤^[2],交通条件,高级生命支持的时效性^[3],心肺复苏术实施者的体质量指数、体质和救治能力^[4-5]。在行驶的救护车上进行心肺复苏时,施救者难以维持身体平衡,这极大地降低了胸外心脏按压的质量,进而导致心肺复苏的失败^[6]。本研究中,我们介绍了一种新的胸外按压辅助装置,该装置的目的是尽量使复苏实施者保持身体的平衡,从而降低救护车行驶对胸外心脏按压的不利影响,进而提高胸外心脏按压的质量。目前国内外尚缺乏此类平衡固定架对胸外心脏按压质量及复苏实施者背部疼痛的研究,笔者将实验结果报告如下。

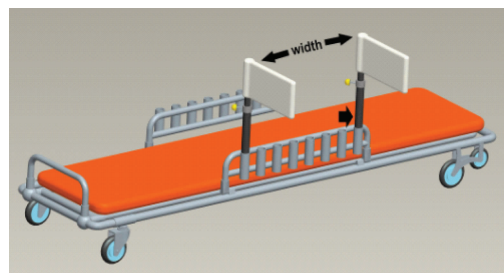
本研究起止时间为2012年1—5月。

1 资料与方法

1.1 一般资料 我们共模拟40个院前呼吸心搏骤停救护车转运场景,当救护车开始离开模拟现场时开始进行胸外心脏按压,救护车停在医院门口即结束胸外心脏按压,路线约10.4 km、约10 min的救护车行程。每个模拟场景两个复苏实施者进行心肺心脏按压术,按压与通气比例为30:2,按压频率为100~120次/分^[7],深度为5~6 cm,同时两名复苏实施者每2分钟交替进行通气和按压。整个实验通过球瓣面罩进行通气,但不评价通气质量。我们设计的保持施救者稳定的平衡固定架如图1所示。

1.2 方法 通过随机数字表法将40个模拟场景分为两组,每组20个。一组应用平衡固定架的辅助进行胸外心脏按压,而在另一组中未应用平衡固定架的辅助进行胸外心脏按压。

1.3 观察指标 实验通过ZOLL系列除颤起搏监护仪(美国卓尔医学产品公司)上的心肺复苏反馈系统获得胸外心脏按压质量参数包括按压深度、有效按压比例及按压中断时间比例,同时通过



注:平衡固定架的杆(箭头所示)被插入到担架上的插孔以固定,可调整杆的高度使矩形塑料板与复苏实施者的髋部保持同一高度水平;两组平衡固定架之间的距离取决于复苏实施者臀部的宽度。这个装置使复苏实施者和担架、模拟人保持相对固定的位置

图1 平衡固定架示意图

numerical rating scale 疼痛数字评价量表^[8]评价复苏实施者背部疼痛程度。

1.4 统计学方法 应用SPSS 13.00统计软件进行分析。计量资料符合正态分布的以 $\bar{x} \pm s$ 表示,组间比较采用两独立样本的 t 检验;不符合正态分布的以 $M(IQR)$ 表示,组间比较采用两独立样本的Mann-whitney U 检验。以 $P < 0.05$ 为差异有统计学意义。

2 结果

与未应用平衡固定架组相比,应用平衡固定架组有较高的有效按压深度比例、较低的按压中断时间比例和背部疼痛评分($P < 0.01$)。见表1。

3 讨论

高质量的胸外心脏按压是挽救院前心搏骤停病人的关键。救护车的速度、加减速和制动等多种因素对胸外心脏按压的质量有影响,在行驶的救护车车厢内空间狭窄,胸外心脏按压实施者重心不稳,容易车内跌倒,同时按压深度和频率难以控制,速度改变容易导致按压的中断。临床研究表明在行驶的救护车上心肺复苏术质量明显下降^[9-11],按压中断的比例为27%~53%,且50%的胸外按压达不到有效深度,这种情况随着时间的延迟和救护车速度增加而更为明显。一项研究表明^[12]当救护车

表1 两组模拟胸外按压各20场景的胸外按压质量和背部疼痛评分的比较

项目	应用平衡固定架组	未应用平衡固定架组	t(Z)值	P值
救护车的平均速度/(km/h, $\bar{x} \pm s$)	54.73 $\pm$ 3.76	56.37 $\pm$ 3.43	-1.44	0.158
每个场景胸外按压的次数/(次, $\bar{x} \pm s$)	1 330.75 $\pm$ 123.22	1 266.60 $\pm$ 113.55	1.70	0.095
每个场景的时间/(min, $\bar{x} \pm s$)	11.45 $\pm$ 0.80	11.11 $\pm$ 0.70	1.48	0.156
每分钟胸外按压的次数/(次, $\bar{x} \pm s$)	116.32 $\pm$ 9.12	114.04 $\pm$ 7.88	0.67	0.403
有效按压深度比例/(%, $\bar{x} \pm s$)	72 $\pm$ 4	50 $\pm$ 3	6.84	<0.01
按压中断时间比例/(%, $\bar{x} \pm s$)	10 $\pm$ 3	24 $\pm$ 5	-11.46	<0.01
背部疼痛评分/[分,M(IQR)]	1.5(1.0)	3.0(1.0)	(-3.55)	<0.01

时速为30 km/h,按压中断时间比例为28.9%,有效按压深度比例为82.3%,当救护车速度为提高到60 km/h,按压中断时间比例升高为30.5%,有效按压深度比例降低为77.6%。而另外一项研究^[13]显示当救护车加速时间占总行驶时间60%的时候,胸外按压中断时间的比例高达42%。目前我们的研究进一步表明救护车转运过程中胸外按压质量是低下的,按压中断时间比例为24%,有效按压深度比例为50%,此外我们的研究显示该平衡固定架通过使实施者保持身体平衡,进而将按压中断时间比例降低14%、有效按压深度比例提高22%。

胸外心脏按压用腰部和背部的力量的反复作用,可以很容易地引起背部疼痛。背痛作为复苏实施者的一种职业症状,在临床中得到了初步的重视,调查^[14-16]显示71.8%的急救人员中存在背部损伤,且这些损伤与胸外心脏按压相关,他们的背部疼痛已经不同程度地干扰复苏实施者平时的运动、工作和睡眠。我们背部疼痛的评价结果显示,平衡固定架可以降低实施者背部疼痛的程度。

机械胸外按压装置,如LUCAS和AutoPulse,在发达国家已应用了20年。研究表明这些装置可以增加冠状动脉灌注压、血压和脑血流^[17]。然而,这些器械价格昂贵,这也限制其在发展中国家和不发达地区的使用。我们的设备从保持施救者身体平衡的角度出发,价格低廉,更为实用。

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(收稿日期: 2017-05-12, 修回日期: 2018-12-18)