A study on the Quality Analysis of CPR Techniques after CPR Simulation Education

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Abstract

This study was conducted to verify the effect of two training methods on the first responder police officers' quality of CPR skills by measuring the accuracy of CPR performance. The subjects were consisted of 50 police officers. Subjects were divided into two groups; 25 in hands-only CPR training group and 25 in traditional CPR training group. For homogeneity, before assigning to two groups, accuracy of CPR skills was measured. And then participants was assigned two groups based on scores. The collected data were analyzed using the SPSS/WIN 22.0 program. The significance level was p<.05. After two CPR training methods, hands-only CPR training and traditional CPR training, quality of CPR technique was good in both groups. There was no significant difference in accuracy in most cases. In detail, scores of chest compression rate, chest compression rate accuracy, chest compression depth, chest compression depth accuracy, chest relaxation rate accuracy and chest compression position were better than those of before training. The score of compression rate was slightly higher in hands-only CPR training group, but scores of both groups are in the standard. So it didn't have any meaning. As a result, both hands-only CPR training and traditional CPR training were efficient training methods. After training, it was confirmed that the CPR skills were improved. Therefore to perform proper CPR skills, the first responder police officers should take CPR training whether hands-only CPR or traditional CPR. After CPR training, the CPR skills of police officers were improved. To find a more efficient training method, it is need to evaluate CPR quality at 6 months after training.

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Introduction

According to the results of the acute cardiac arrest survey, CPR has an immediate effect on the survival rate of cardiac arrest patients. Therefore, when a patient is found, promptly report to 119 and repeated CPR education and publicity are paramount factors in order to increase bystander CPR performance (Kim G. W. et al., 2020). According to Korea centers for disease control and prevention's acute cardiac arrest survey, the total number of cardiac arrests in Korea is increasing to 19,480 in 2006, 25,909 in 2010, 30,309 in 2014, and 29,262 in 2017. This can be said to be about 7 times higher than the 4,152 deaths from traffic accidents. The reasons for this trend are aging society and an increase in the prevalence of cardiovascular diseases.

Regardless of gender ratio in cardiac arrest incidence, male (64.8%) had a higher incidence than female (35.2%). Cardiac arrest is common among people in their 50s and older, and it can be seen that the incidence increases as they get older (Kim G. W., 2020; KCDC, 2019).

Based on the cardiac arrest statistics, most of acute cardiac arrests occur outdoors and home. As a result of the acute cardiac arrest survey by the Ministry of Health and Welfare, 20.4% of domestic cardiac arrest patients occurred in public places, and 65.1% occurred in non-public facilities such as homes and medical institutions (KCDC, 2019). Patients with cardiac arrest that occurs out of hospital, such as at home, are more difficult to respond efficiently than cardiac arrest patients that occur in hospitals. In the event of cardiac arrest, rapid CPR and the use of an automatic electronic defibrillator are paramount until the ambulance arrives. So, we should find an alternative through detailed analysis for cardiac arrest that occurs out of hospital, especially at home and in public places (Arthur G. et al., 2011; Craig-Brangan K. J. et al., 2016; Vadeboncoeur T. F. et al., 2014).

The Act on Emergency Medical Care considers police officials, school nurses, tourism business workers, and safety workers and life-saving personnel among the first responders to the field. In the case of police officials, it was found that the average arrival time at the site according to the emergency report as of the end of 2017 was ahead of the average arrival time of 119 fire brigades (Idris A. H. et al., 2015; Korean National Police Agency, 2018). In fact, it can be said that the police are in contact with the first responders to cardiac arrest. Accordingly, police officials are required to improve their initial response to emergency situations.

It is required to establish standards related to CPR education for efficient CPR. The importance of CPR education can be confirmed by mandating the completion of retraining to acquire new knowledge and skills every year (Kovacs A., et al., 2015; Souchtchenko S. S., et.al 2013; Park S. H. 2006). Several previous studies confirm this. Since CPR knowledge and skill skills decrease over time, retraining is absolutely necessary for effective CPR (Back M. R., 2001). The American Heart Association also recommends retraining within two years after completing the first training in order to properly maintain the educational effectiveness of CPR. However, in some studies, the knowledge and skill ability of CPR after the first training decreased much earlier than this. In the preceding study, re-education should be carried out between 2 and 4 months after related education (Kim E. J., 2018), or re-education should be carried out 6 months before (Cunningham L. M., et al., 2012).

In this way, police officials who are likely to become first responders at the site of cardiac arrest patients should receive regular emergency medical training. It is judged that citizens have an obligation to properly prepare for crisis situations such as heart arrest, where they do not know when and where they will occur. In order to increase the survival rate of patients with cardiac arrest at the level of advanced countries, even in Korea, police officials who are likely to become first responders must be able to respond immediately to emergency situations. More active policy efforts are required to strengthen support for cardiopulmonary resuscitation and training on the use of automatic cardiac shock devices. This study attempted to establish a CPR education method by grasping the accuracy of CPR techniques and continuity of education after CPR training for the first responder police officers. In addition, it was intended to compare the accuracy of CPR techniques for each teaching method by applying two teaching methods: traditional resuscitation education and chest compression resuscitation education.

The purpose of this study was to compare the accuracy of CPR training immediately after training in the traditional CPR training group and the chest compression resuscitation training group. The purpose of this study is to improve the initial response system for patients with cardiac arrest by police officials for effective

CPR education methods of police officials as first responders based on the results of the study.

Materials and Methods

The subjects of this study were consisted of the first responder police officers working in D area. Two CPR training was conducted for 60 minutes. In order to secure the homogeneity of experimental groups A and B, the number and duration of CPR training before the experiment were investigated, and after grouping based on scores, the experimental group and the comparison group were expressed in mating with subjects within the same range.

Study design

This study was an experimental study to verify the accuracy of CPR by dividing the first responder police officer occupation group into chest compression resuscitation training group and traditional method of resuscitation training group. It is a design in which a similar experiment is conducted before and after the non-equivalent comparison group to verify the continuing effect of education by measuring the effect of the two education methods on the accuracy (performing ability) of the police officer's CPR technique.

CPR technique accuracy

The mannequin used to measure the accuracy of the CPR performance technique in this study was Brayden Pro (Innosonian Inc., Seoul, Korea) set up by the American Heart Association to meet the 2015 CPR guidelines. For this study, the company decided to use Brayden Pro without cost requirement (Figure 1).

Figure 1: Brayden Pro (Innosonian Inc., Seoul, Korea)

Before measuring the accuracy, the research team reconfirmed whether the mannequin was set up to meet the 2015 CPR guidelines by the American Heart Association. After that, I connected the Brayden Pro application to the tablet PC with the mannequin and switched to evaluation mode. Technique accuracy data (chest compression depth, compression depth accuracy, chest compression speed, compression speed accuracy, chest relaxation rate accuracy, compression position accuracy) were collected. This was used as data for this study.

CPR training program
Traditional CPR training program

The educational program used in this study is "video for the basic curriculum of the standard CPR standard education program for general people", and the educational video is a standardized educational program distributed by the Korea Centers for Disease Control and Prevention. The video consists of about 40 minutes

of listening to the definition of CPR and explanation of the CPR method, so that you can practice 210 chest compressions for 30 minutes. After 30 chest compressions, artificial respiration is performed twice, and repetition of chest compressions and artificial respiration is taught.

In this study, according to the guidelines of the American Heart Association 2015, the depth of chest compression was defined as at least 5cm, and it was evaluated that 5cm ~ 6cm were precisely compressed. The compression rate is 100 to 120 times per minute. The compression position was based on the 1/2 point below the middle part of the breastbone. In CPR, 30 chest compressions and 2 artificial respirations were performed for 5 cycles per person, and 210 chest compressions were performed for chest compression CPR.

Hands only CPR training program

The educational programs used in this study are as follows in Table 1. "The video for the basic course of the standard CPR training program for general people" was used. The educational video is a standardized educational program distributed by the Korea Centers for Disease Control and Prevention. This video is composed of about 40 minutes to listen to the definition of chest compression CPR and explain the method of CPR, so that you can practice 210 chest compressions for 30 minutes.

In this study, according to the guidelines of the American Heart Association 2015, the depth of chest compression was defined as at least 5cm, and it was evaluated that 5cm ~ 6cm were precisely compressed. The compression rate is 100 to 120 times per minute. The compression position was based on the 1/2 point below the middle part of the breastbone.

Table 1: Traditional CPR and hands only CPR program

Item	Traditional CPR	Hands only CPR
time	60 minutes	60 minutes
contents	• Basic life support practice by watching videos • Traditional CPR practice • Automatic defibrillator training • Measurement after chest compression and artificial ventilation training	• Basic life support practice by watching video • Hands only CPR practice • Automatic defibrillator training • Measurement after hands only chest compression resuscitation training

CPR: cardiopulmonary resucitation

This study was an experimental study to verify the accuracy of CPR by dividing the first responder police officer occupation group into chest compression resuscitation training group and traditional method of resuscitation training group. It is a design in which a similar experiment is conducted before and after the non-equivalent comparison group to verify the continuing effect of education by measuring the effect of the two education methods on the accuracy (performing ability) of the police officer's CPR technique.

Statistical analysis

It was divided into 25 experimental groups consisting of the chest compression CPR training group and 25 comparative groups consisting of the traditional CPR training group. After explaining the educational method to the subject in detail, the experiment was conducted only for subjects who recognized the purpose of the study and agreed in writing. The data collected in the study were analyzed using the SPSS/WIN 22.0 program. All statistical analyzes were analyzed at the significance level $p < .05$.

Results and Discussion

The results of comparing the CPR between the chest compression group and the traditional method group before CPR training are as follows in Table 2. As a result of CPR analysis of the chest compression CPR training group and the traditional CPR training group, homogeneity was secured as follows.

Table 2: Homogeneity results of chest compression before CPR education

Variables		Mean	SD	t	p-value
Compression speed (times/min)	Hands only CPR	136.1	6.7	0.163	0.815
	Traditional CPR	132.4	5.9		
Compression speed accuracy(%)	Hands only CPR	14.5	26.4	0.185	0.966
	Traditional CPR	14.6	24.6		
Compression depth (cm)	Hands only CPR	4.5	1.5	0.112	0.943
	Traditional CPR	4.5	1.4		
Compression depth accuracy(%)	Hands only CPR	27.6	33.9	0.258	0.756
	Traditional CPR	26.0	27.2		
Recoil rate accuracy(%)	Hands only CPR	71.1	35.2	0.128	0.875
	Traditional CPR	69.7	33.1		
Pressure position accuracy(%)	Hands only CPR	83.1	22.4	0.560	0.542
	Traditional CPR	80.1	32.1		

SD: standard deviation

There was a statistically significant difference in chest compression rate as 116.1118.3±6.6 times/min in the chest compression resuscitation training group and 114.6±7.9 times/min in the traditional method resuscitation training group (p=0.043).

However, the mean of both groups is within the standard range, and it is interpreted that both groups showed good results. The accuracy of chest compression rate was 66.7±21.5% in the chest compression resuscitation education group and 65.9±22.7% in the traditional method of resuscitation education group (p=0.974). This is also a good result, and the fact that there is no difference between the two groups is interpreted that the educational effect was high in both groups.

The chest compression depth was 5.4±0.8cm in the chest compression resuscitation education group and 5.3±0.7cm in the traditional method of resuscitation education group (p=0.765). There was no difference between the two groups, but the standard of chest compression depth was 5~6cm, and the average value of the two groups showed excellent educational effect. There was no difference in the accuracy of chest compression depth at 63.7±28.6% in the chest compression resuscitation training group and 57.9±24.7% in the traditional method of resuscitation training (p=0.558). There was no difference in the accuracy of the chest relaxation rate at 78.5±27.5% in the chest compression resuscitation training group and 79.3±25.4% in the traditional method of resuscitation training (p=0.886). There was no difference in the location accuracy of chest compressions in the chest compression resuscitation training group, 96.7±2.8%, and the traditional method resuscitation training group, 97.8±4.7% (p=0.176). The fact that there was no difference in their results was judged to have a good educational effect in both groups.

Table 3. Comparison of CPR technique accuracy immediately after training

Variable		Mean	SD	t	p-value
Compression speed (times/min)	Hands only CPR	118.3	6.6	2.243	0.043
	Traditional CPR	114.6	7.9		
Compression speed accuracy (%)	Hands only CPR	66.7	21.5	0.156	0.974
	Traditional CPR	65.9	22.7		
Compression depth (cm)	Hands only CPR	5.4	0.8	0.178	0.765
	Traditional CPR	5.3	0.7		
Compression depth accuracy (%)	Hands only CPR	63.7	28.6	0.676	0.558
	Traditional CPR	57.9	24.7		
Recoil rate accuracy (%)	Hands only CPR	78.5	27.5	0.187	0.886
	Traditional CPR	79.3	25.4		
Compression position accuracy (%)	Hands only CPR	96.7	2.8	1.888	0.176
	Traditional CPR	97.8	4.7		

SD: Standard Deviation

As a result of the analysis of the study, chest compression CPR and CPR technique accuracy immediately after two teaching methods, chest compression rate, chest compression rate accuracy, chest compression depth, chest compression depth accuracy, chest relaxation rate accuracy, chest compression position. There was no significant difference in accuracy in most cases. The score was slightly higher in the chest compression CPR training group. As a result, it was confirmed that chest compression CPR training was more efficient. To protect the lives of the people as well as the body and property, police officers must receive various training and apply them to actual field work. To this end, one of the education required for police officers to perform their duties is first aid and CPR education.

First responders' first aid has a decisive effect on the patient's survival rate. In developed countries, CPR and automatic defibrillator training have been offered to police officials who are the first responders (Bentley J. et al., 2010). In the Netherlands, between 1999 and 2000, CPR, automatic defibrillator, and police training were conducted for police officials as first responders. Basic life support (BLS) and automatic cardiac shock and equipment were available during the training of police officers (Wilson E. et al., 1983). In addition, in the UK, police officers in London for 3 years from 1997 to use automatic cardiac shock devices and receive first aid training (Paula R. W., et al., 2001; Angulo P. et al., 2017). The United States has created a system called "Certified First Responder (CFR)," which requires basic first aid treatment until emergency medical personnel arrive at the site. The target is education and training for occupational groups with high possibility of access for the first time to emergency sites, including firefighters, police officers, and occupational health managers (Geri G. et al., 2017; Nicolas M. et al., 2017). In this way, advanced countries systematically provide education for first responders. In Korea, the Ministry

of Health and Welfare or each Mayor/Do Governor is stipulated to provide rescue and first aid-related education for occupational groups that can be considered as the first responders to the Enforcement Decree of the Emergency Medical Act (Shin D. M. et al., 2020; Rizwan D. et al., 2018; Baek M., 2000). Nevertheless, Korea's CPR training, which is administered to first responders, has a problem that there are no specific legal standards for methods and contents, so various institutions provide education in various ways.

Conclusion

Based on the research results, we propose a plan for realizing CPR education for police officials. After education, it was confirmed that the CPR skills improved. In order to find a more short-term and efficient education method, the two education methods were divided into two, but both groups showed good results. In preparation for the educational environment after Corona 19, It is necessary to institutionalize the first responder, emergency treatment education for police officials, as a practical education, and expand the emergency medical/rescue infrastructure through the supply of emergency medical kits.

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