A Critical Evaluation of a Study Focusing on a Preferred Cardiopulmonary Resuscitation Technique in Infants

Abstract

Motivation/Problem Statement: This paper critically evaluates a study that discusses the preferred infant cardiopulmonary resuscitation technique. Confusion regarding infant cardiopulmonary resuscitation techniques is a common phenomenon that can result in life-threatening situations. Cardiopulmonary resuscitation techniques today are based on evidence gleaned from different studies and guidelines; however, few studies have discussed the superiority of one technique to another. Therefore, the aim of this paper is to identify the most effective cardiopulmonary resuscitation technique for infants.

Introduction

In cardiac arrests in infants, there is artificial respiration, which is provided via cardiopulmonary resuscitation (CPR) for simulated life support. In such situations, there is an imminent danger to the infant's life; therefore, the American Heart Association (AHA) recommends that bystanders and others carry out infant CPR to individuals. Additionally, the two-thumb (TT) technique is preferable for infants less than one year old; however, if the rescuer (s) cannot physically encircle the victim's chest, then the two-finger (TF) technique would be more appropriate to achieve effective chest compressions.

Search Strategy

The Scopus, Pubmed and Ovid Medline databases, among Cardiff University's subject resources for operating department practitioners, were searched to find an appropriate article. The keywords used to search the databases were: CPR, infant and two-thumb. The limitations on the search were: articles published between 2005 and 2013 so as to get information on up-to-date evidence-based practice, articles in English as translation takes more time than was available, clinical trial as they are the gold standard when conducted appropriately and humans for ethical consideration see Appendix. The article by Huynh et al. [2] was chosen as it was that which conformed most closely to the rationale and aim of this study. This article was evaluated using a critique framework devised by Ingham-Broomfield [1].

Article Critique

The selected study was carried out by Huynh et al. [2] to assess CPR in infants using the TT and TF techniques on various surfaces. The aim of the study is clearly presented in the introduction and the authors identify a gap in the literature in regard to infant CPR techniques that motivated them to conduct their research. No justification for the chosen research method appears in the paper; although this could have increased the rigour and validity of the study [4]. The study's hypothesis is that the TT technique is better and more effective than TF on all surfaces.

Conclusion:

In conclusion, it is difficult to ascertain the best method for infant cardiopulmonary resuscitation and there is a need for more studies to investigate the best infant cardiopulmonary resuscitation technique. Future studies will help to improve current practice and will add to the evidence base of practice.

Keywords: Cardiopulmonary resuscitation; Infant; Two-thumb
In this research, a randomised crossover design was used to guide the study. It is a study design in which participants are subjected to diverse treatments and randomised into different groups, but all groups receive the same treatment to compare the influence of intervention [5]. This allows a determination of the effect of each of treatment on each subject [6]. This methodology was considered a good fit for the study purpose, which was to compare the effects of TT and TF techniques and provide appropriate infant CPR on different surfaces [7]. To reduce the risk of intervention bias, participants were randomised into two different groups, which reduced bias because randomly allocating is an equivalent process to flip a coin to either one intervention. To maintain participant blindness, they were not informed about their performance during the procedure; this is important to reduce one source of bias in research, as participants often tend to alter their behaviour in a particular way if they are told about certain aspects of the study [5].

Twenty participants were recruited for the study, including various neonatal practitioners already trained in providing infant CPR. The method used for their recruitment was, however, not explained and no inclusion or exclusion criteria mentioned is mentioned [7]. The generalizability of this study’s results is questionable as all participants were trained staff [8]. Further, there is also no sample size analysis or pilot study discussed in the paper, although these are considered important to increase validity (ref). That said, participants were included in the study only after obtaining informed consent; thereby satisfying the ethical requirements for conducting such research [9]. The data collection method is explained well, including the type of manikin used for the research and since a pilot study was not conducted, it is assumed that the validity and reliability of the data collection tool were also not checked to reduce a possible source of bias [10,11].

Finally, the statistical processes for data analysis are a student t-test and ANOVA, which are beneficial to determine the difference between three or more groups that are unrelated [12], whilst the discussion section identifies the limitations and merits of the study in a clear manner. Accordingly, it can be concluded that the article is comprehensible and readable with the results presented in a Table. The abbreviations used in the literature are also described in a complete and helpful way to make them more comprehensible to a layperson.

**Main Findings**

The study results indicate that compression depth using the TT method is favourable, on the floor (TT = 27 ± 8 mm vs TF = 23 ± 7 mm), table (26 ± 7 mm for TT vs 22 ± 7 for TF); while in a warmer situation (TT = 29 ± 4 vs TF is 23 ± 4). Moreover, decay in compression was also higher with the TT technique than with the technique TT on the floor and in a warmer situation compared to on a table. Participants also favoured a table to a radiant warmer or floor because it was considered less tiring and more appropriate. Therefore, the authors conclude that the TT technique is more appropriate for teaching infant CPR as it achieves greater compression depth, has less decay over time, and better predictability [3].

**Evaluation of Findings and Implications for Practice**

The study recommends using the TT technique for infant resuscitation, as it is easier to perform, and causes less finger fatigue compared to TF. Using TT also results in increased blood flow from the heart to the rest of the body by increasing systolic blood pressure, and therefore produces a higher coronary perfusion pressure leading to increased sternal compression force [3]. Based on evidence from recent studies, the AHA now includes the TT technique as an effective alternative approach to TF [13]. In addition, various clinical studies have been conducted that have concluded that the TT technique is considered easier and more effective for chest compressions, because it results in lateral compression with sternal compression by squeezing the chest, whereas TF only results in sternal compression [14-17].

This study suggests that compressions are more effective with the TT technique on all surfaces, regardless of the number of rescuers. Nevertheless, some practitioners suggest that TT is a more effective approach when performed by more than one rescuer [17]. Therefore, with robust evidence from recent studies, the focus of training can be shifted to techniques that are more productive for infant CPR. It follows, therefore, that the TT technique is preferable if the victim is an infant of less than one year old [18]. If, however, the rescuer(s) cannot physically encircle the victim’s chest, then the TF technique would be more appropriate to achieve effective chest compressions [19].

Most providers are not specialists in delivering infant CPR, as cardiopulmonary arrest is much less common in infants than in adults [16]. Therefore, it is essential to provide refresher sessions to retrain staff in infant CPR since they do not practise it as often as they do adult CPR. Woolard et al. [20] conducted a randomised control trial study with 75 participants to determine the appropriate timing for refresher training in CPR skills in general and recommend that refresher training should be given no more than seven months after primary training. Therefore, since adult CPR needs refresher training within seven months, infant CPR skills would need a smaller gap between primary training and refresher training.

Starting infant resuscitation immediately, with appropriate education, proves to be beneficial in improving the infant mortality rate [15]. Staff should, therefore, be confident, expert, and well trained in performing CPR with a focus on the TT technique and understand the differences between infant and adult CPR. Indeed, this is an essential consideration, because if CPR is not administered correctly it may not only be useless for the patient but even damaging [3]. In addition, maternity and paediatric department staff must be well trained because of their daily exposure to infant and paediatric patients [21], and achievement of this could be achieved by running training workshops and practice evaluations every month. Moreover, preparations in all departments, with the necessary tools of various sizes for infant resuscitation, are important to reduce any delay or interruption in delivering intervention [22].

Infants may also suffer cardiopulmonary arrest at home, which can be a particularly harrowing experience with only their parents in attendance. Therefore, providing sessions to train parents or other laypersons to act as rescuers and initiate resuscitation would be beneficial, as this would decrease the mortality rate of infants due to delayed CPR intervention [23]. Training sessions could be initiated in antenatal clinics or as a post-natal discharge requirement [21,24].

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Efficient team dynamics is another important factor, as the resuscitation process requires an effective team approach from various hospital departments [25]. This can be achieved by establishing a code for a CPR emergency understood by all departments in a hospital setting, as team members require smooth and unimpeded communication for effective basic life support. Joint Commission [26] statistics indicate that, in 47 cases, 72% of infant mortality is the result of a lack of appropriate communication between team members and the organisational culture. In maintaining the traditional hierarchy and failure to deliver CPR effectively as a team form a barrier to effective communication [27]. Therefore, team dynamics require an appropriate leadership style, besides smooth and effective communication, in order to improve operational performance and identify weaknesses in resuscitation delivery through guiding and overseeing the rest of the team [28]. An equal simulation technique is also advised for training in rescuer team dynamics in order to achieve excellence in resuscitation outcomes [29].

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