Novel method of infant chest compression. Does the arrangement of the thumbs matter?☆

Dear Editor,

Following the discussion [1-3] on a novel technique for chest compression in infants and newborns (nTTT), described in the *American Journal of Emergency Medicine* [4], we decided to examine whether the angle of chest compression in accordance with the technique affected the basic quality parameters of resuscitation. Infant chest compression with nTTT is described as follows: "the 'new two-thumb technique' (nTTT) of chest compressions in an infant consists in using two thumbs directed at the angle of 90° to the chest while closing the fingers of both hands in a fist" [5]. Observing the discussion on nTTT, we paid special attention to the angle of thumbs in relation to the chest wall. The main advantage of the new technique is that the alignment of thumbs with the arms increases the compressive force exerted on the chest, which in the case of the two-finger technique mainly depends on the muscle strength of the fingers and the whole hand. We therefore decided to compare the basic chest compression quality parameters during infant resuscitation.

After receiving an approval by the Institutional Review Board of the Polish Society of Disaster Medicine (approval no.: IRB N 12.07.2018), we performed a cross-over randomized manikin study in a group of 36 paramedics. Each participant received information about the study and voluntarily agreed to participate. The subjects were to perform single-rescuer 2-min cardiopulmonary resuscitation with the use of an ALS Baby trainer manikin (Laerdal Medical, Stavanger, Norway) simulating a 3-month-old infant. In order to allow comparison with previous studies, the manikin was placed on a high adjustable hospital stretcher at the level of the iliac crest of each rescuer for standardization. The resuscitation was performed in accordance with the current pediatric basic life support resuscitation guidelines (15:2 chest compression to ventilation rate with the recommended 100–120 chest compressions per minute). The study involved 2 scenarios; the participants were randomly assigned to performing resuscitation with both scenarios in a randomly assigned order with a 20-min break before applying the other CPR technique. Scenario A consisted in implementing the correct nTTT chest compression technique with two thumbs directed at the angle of 90° to the chest while closing the fingers of both hands in a fist. Scenario B included a modified nTTT technique with two thumbs directed at the angle of 45° instead of 90° (Fig. 1). We evaluated chest compression depth, chest compression rate, percentage of compressions with correct depth, percentage of chest compressions with the recommended rate, and percentage of complete chest relaxation. The data were analyzed with the Statistica software v.12 (StatSoft Inc., Tulsa, USA). The Research Randomizer software (www.randomizer.org) was used for randomization. The median depth (mm) of chest compression was 39 (37–40) in scenario A and 36 (35–39) in Scenario B ($p = 0{,}009$), and the percentage of compressions with correct depth (%) achieved equaled 79 (59–86) vs 64 (57–81) ($p = 0.018$) in scenarios A and B, respectively. The chest compression rate (compressions per minute) turned out 116 (110−122) vs 113 (103–126) (p = NS), and the percentage with the recommended rate (%) was 92 (83–94) vs 93 (80–92) ($p = 0{,}031$) in scenarios A and B, respectively. The percentage of complete chest relaxation (%) was 99 (98–100) in scenario A and 94 (83–97) in scenario B (p = 0,047). In our study, the median chest compression depth was better that with the modified incorrect nTTT and almost achieved the recommended 40 mm. The same appeared with the percentage of compressions with correct depth and percentage of complete chest relaxation. Our preliminary results indicate that the angle at which the rescuer directs the thumbs to the chest is important in nTTT and can influence the results. Our results suggest that when comparing nTTT with other techniques, including the 2-finger technique (TFT) recommended for lone rescuer and the 2-thumb-encircling hands technique (TTHT), it is very important to ascertain that the correct nTTT chest compression technique with 2 thumbs directed at the angle of 90° to the chest while closing the fingers of both hands in a fist is used; otherwise it can impede the results.

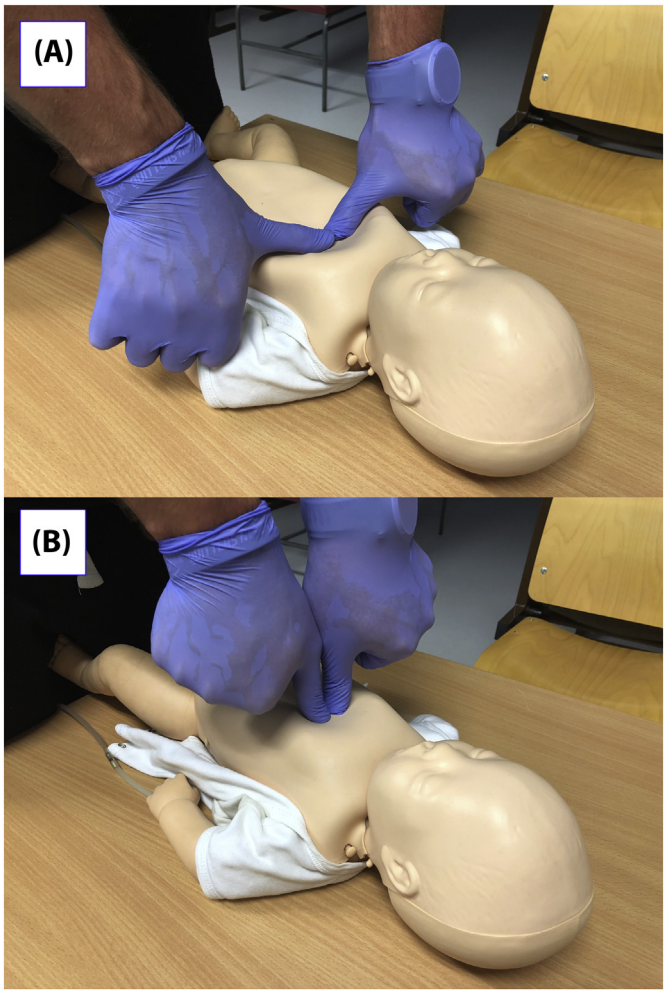

Fig. 1. New infant chest compression technique: two thumbs directed at the angle of 45° (A) instead of 90° (B).

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Diabetes mellitus and hypoglycemia as a complication of intravenous insulin to treat hyperkalemia in the ED

We read with interest the article by Scott NL et al. "Hypoglycemia as a complication of intravenous insulin to treat hyperkalemia in the emergency department" that have been published in the American Journal of Emergency Medicine [1]. This interesting retrospective study reports on the rate of hypoglycemia following intravenous insulin treatment for hyperkalemia in the emergency department setting and furthermore describes which variables were independently associated with this outcome: Lower glucose level prior to insulin administration, higher doses of administrated insulin and lower doses of administered 50%dextrose were independently associated with hypoglycemia in the multivariate analysis. Age, history of diabetes, and history renal failure were not independently associated.

The authors of the study have collected and analyzed a large amount of data, leading to interesting debate. Nevertheless, we would like to address them one question that may contribute to further, more detailed discussion of the issue.

The authors as well as in several other studies [2,3], involved diabetes mellitus into the analysis as one disease. But diabetes mellitus is a group of metabolic diseases resulting from various pathogenic defects which may be treated by different ways and therefore a risk of hypoglycemia may differ between individual patients.

Based on our clinical experience we can speculate that the highest risk of hypoglycemia after insulin administration due to treatment of hyperkalemia is associated with type 1 diabetes patients. The main reasons for our believe are 1) these patients are at higher risk of hypoglycemia due to insulin treatment itself simply said due to failure to clear circulating insulin during hypoglycaemia (this may probably explain 4% of patients experiencing hypoglycemia without i.v. insulin administration mentioned in the study) and hyperkalemia related insulin dose may interfere with previously injected insulin by a patient; 2) lower glucose threshold for release of counterregulatory hormones; and (4) loss of normal pancreatic alpha cell responses [4]; 3) impaired awareness of hypoglycaemia which may be present in 30% and even more patients [4-6], 4) usually good insulin sensitivity [4] (making them more sensitive to even smaller doses of insulin, moreover if they are added to their regular daily doses).

Therefore we believe that it would be interesting to analyze this group of patients to evaluate the risk of hypoglycemia related to hyperkalemia treatment with insulin separately. Because above mentioned disorders 1–3 are also to some extent presented in type 2 diabetes patients [4,7], those treated with insulin or sulphonylurea derivates could also be an interesting focus on analysis.

We, with great respect, suggest taking these comments into the account and also consider them, if the continuation of the study is planned.

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Conflict of interest statement

The authors do not have any conflicts of interest to declare.

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