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Which intravascular access technique should we use for COVID-19 patient resuscitation: a preliminary investigation

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TO THE EDITOR

Obtaining vascular access is a key procedure in hemodynamically unstable patient conditions (1). This is particularly important for patients with cardiac arrest, where the American Heart Association (AHA) as well as the European Resuscitation Council (ERC) recommendations for non-shockable rhythms recommend that vascular access and adrenaline supply be provided as soon as possible (2, 3). Under CPR conditions, the vascular bed is collapsed, therefore numerous attempts at intravenous access may prolong the time to administer drugs and CPR fluids, as well as cause the rescuer to focus too much on one procedure, while under out-of-hospital CPR settings the number of members of the emergency team is limited and the need for chest compressions, as well as airway management and ventilation support, are important (4). Ready-to-use kits for performing intraosseous accesses, including NIO-Adult, which is an example of an automatic, spring-loaded, single-use intraosseous access device (fig. 1), may be helpful in this respect.

The aim of the study was to compare the success rate, procedure time, and user satisfaction of NIO-Adult compared to intravenous access performed by paramedics wearing full personal protective equipment during simulated suspected/confirmed COVID-19 adult patient resuscitation.

To reduce the risk for the patient as well as for the paramedics themselves, the study was designed as a randomized cross-over simulation study. To simulate a patient with suspected COVID-19 requiring resuscitation (including vascular access), Resusci Anne Advanced Skill Trainer manikin (Laerdal, Norway) was used, which was placed on a flat floor. The resuscitators provided vascular access dressed in a full ProChem IF suit protecting high concentrations of organic and inorganic chemicals. Additionally, they used double gloves. During the study, they had to perform the intravascular access using two methods: the proximal tibial access (IO) using a ready-made NIO-Adult kit; and the intravenous access (IV) using a standard 18G intravenous kit into the ulnar veins. The order of the methods of obtaining the intraosseous access as well as the order of participants was random. The Research Randomized program was used for this purpose.

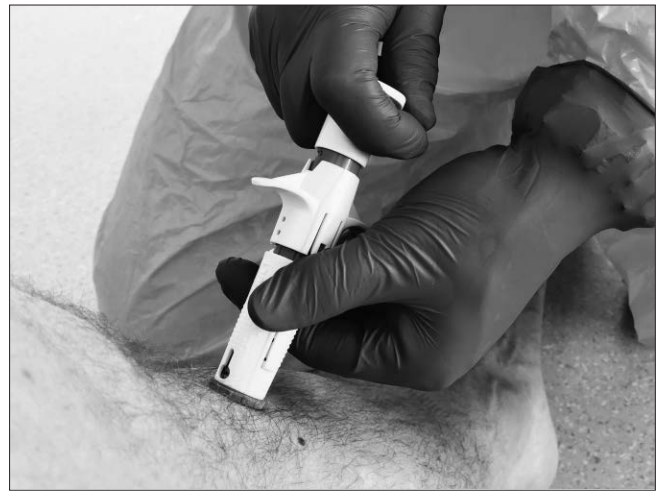

Fig. 1. NIO-Adult intraosseous access device

The results were analyzed using the statistical package STATISTICA 13.3EN (Tibco Inc., USA) or Review Manager 5.4EN (Cochrane Collaboration, Oxford, UK).

At the stage of statistical analysis, the results of the study were blinded. Group differences in dichotomous data are expressed as odds ratios (ORs) and group differences in continuous data as mean differences (MDs), both with 95% confidence intervals (CIs). The fixed-effect model was used to pool the results.

15 paramedics participated in the study. The average age was 32 ± 6.4 years, while the work experience in EMS was 7.2 ± 5.9 years. All subjects had clinical experience in obtaining intraosseous access.

The effectiveness of the first attempt to obtain intraosseous access using the tested methods was 100% for IO and 86.6% for IV access respectively (OD = 0.17; 95% CI: 0.01, 3.96; p = 0.27). The time to obtain intraosseous access was 17 ± 5 seconds and was significantly shorter than for intravenous access – 47 ± 14 seconds (MD = -30.0; 95% CI: -37.52, -22.48; p < 0.001). The time measured to start the procedure until fluid infusion was 42 ± 11 seconds for IO vs. 67 ± 21 seconds for IV (MD = -25.0; 95% CI: -37.0, -13.0; p < 0.001). The easy to "10" difficult visual analogue scale ("1") for IO was 3.5 ± 1 points and 7 ± 2 points for IV (MD = -3.50; 95% CI: -4.63, -2.37; p < 0.001).

In conclusion, as many results suggest (5-7) the performance of medical procedures in a protective suit may reduce the effectiveness of the procedure as well as extend its duration. The results of our study indicate a significantly shorter time of intravenous access to the intraosseous access. Besides, as indicated by the respondents, the intraosseous access. In these applications of PPE is an easier procedure to perform than IV access. Further studies are required to confirm the results.

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