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Ultrasound-guidance for intraosseous access could improve resuscitation maneuvers. A retrospective data report on Italian earthquake victims

The use of ultrasound guidance (USG) could improve the insertion of intraosseous access (IOA) into the medullary space.[1] The aim of this data report is to describe as the use of sonographic device can facilitate the insertion of IOA, in the victims of out-of hospital traumatic cardiac arrest (OOH-TCA), providing benefit to obtain return of spontaneous circulation (ROSC).

The primary outcome of our retrospective study (ClinicalTrials.gov Identifier: NCT03491787) was to investigate whether the use of sonography could facilitate the insertion of IOA, improving resuscitation maneuvers in the victims of OOH-TCA, during the earthquake in Amatrice (Italy, August 24, 2016). This was assessed by analyzing ROSC (yes/no), time to obtain ROSC (minutes) and time to obtain IOA (minutes to obtain bone marrow from the needle), in the two groups.

The data were recorded directly on site in the first eight hours of the rescue efforts.

The sites for IOA were: greater tubercle of the humerus, proximal tibia and distal femur.[2]

Our rescue team[3] consisted of two anesthesiologists and four nurses; they were organized in two groups: one anesthetist and two nurses for each group.

Only one rescue team had the ultrasound device (ultrasound group, UG) with linear and a convex transducers connected to a Tablet, because the other one (not ultrasound group, NUG) lost the probes under a collapsed building. The IOA was established with EZ-IO (Teleflex Medical; Arlington Heights, IL, USA).

Data collected were stratified in two groups by USG use (yes/no). Mean and standard deviation, frequencies and 95% confidential intervals were computed. Stata software was used for all analyses.

A total of 157 victims buried under the rubble were treated directly on site by the rescue team. Forty-eight patients were evaluated and treated for TCA. Patients diagnosed with or without USG were perfectly similar in gender.

TABLE I.—*Demographic and other clinical characteristics.*

	Sonography use			
	Yes		No	
	N. (%) or mean (SD)	95% CI	N. (%) or mean (ds)	95% CI
Characteristics				
Age (years)	55 (24.78)	45.12-65.46	49 (22.53)	29.58-58.08
Carotid pulse				
Yes	7 (29%)	14-51%	14 (58%)	37-77%
No	17 (71%)	49-86%	10 (42%)	23-62%
Trauma or anatomic injuries				
Head	7 (29%)	14-51%	12 (50%)	30-70%
Chest	12 (50%)	30-70%	8 (34%)	17-55%
Abdomen	3 (13%)	39-34%	2 (8%)	19-29%
Limbs	2 (8%)	19-29%	2 (8%)	19-29%
Total time to start resuscitation (minutes)	3.00 (2.13)	2.13-3.87	3.37 (1.93)	2.58-4.17
Time for extrication (minutes)	8.67 (3.89)	7.07-10.26	6.63 (4.02)	4.97-8.28
ROSC				
Yes	22 (92%)	71-98%	4 (17%)	6-38%
No	2 (8%)	19-29%	20 (83%)	62-94%
Time to obtain ROSC	6.83 (3.8)	5.24-8.42	10.21 (6.6)	7.43-12.99
Site for intraosseous access				
Humerus greater tuberosity	7 (29%)	14-51%	12 (50%)	30-70%
Proximal tibial	14 (58%)	37-77%	5 (46%)	27%-66%
Distal femur	3 (13%)	4-34%	1 (4%)	0-26%
Minutes to obtain intraosseous access	2.08 (0.58)	1.84-2.32	3.54 (1.84)	2.79-4.30
Time to TCA diagnosis	2.17 (0.96)	1.77-2.56	1.96 (0.95)	1.57-2.35
Interruption to IOA attempt				
Yes	8 (33%)	17-55%	8 (33%)	17-55%
No	16 (67%)	45-83%	16 (67%)	45-83%
IOA attempts	1.29 (0.46)	1.10-1.48	2 (0.88)	1.64-2.36
Interruption time to IOA attempt	26.46 (12.72)	21.23-31.68	28.12 (9.41)	24.25-31.99

Two-sample Wilcoxon rank-sum (Mann-Whitney) test was used for metric variables. Fisher Exact Test was used for categorical variables.
ROSC: return of spontaneous circulation; TCA: traumatic cardiac arrest; IOA: intraosseous access.

Twenty-one patients presented a carotid pulse at the time of extraction but rapidly evolved to cardiac arrest within seconds.

An IOA was obtained in all victims, due to the impossibility of obtaining IV access. The prevalent injured organs were chest (42%) and head (40%). ROSC was obtained in 26 patients (54%).

As reported in Table I, the rescuers without USG spent 3.5 minutes to obtain IOA with two attempts, because of the lack of aspiration of bone marrow and the need to change the site of insertion.

ROSC was obtained in 92% of the patients in UG, while four patients had ROSC in NUG with a significant difference.

In our experience, the rescuers with USG established the IOA in two minutes rather than 3.5 minutes[4] (NUG), so it is possible to speculate that USG for IOA could provide benefits in obtaining ROSC, possibly due to the reduction of time to drug delivery in the systemic circulation.[5]

In conclusion, although multiple confounding factors exist in the context of a natural disaster setting, our findings call into attention the emergency equipment and this study shows that the use of a sonographic device can facilitate the proper insertion of IOA,[5] providing benefits in obtaining ROSC in OOH-TCA victims.

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An alternative technique for effective pain management in upper extremity surgery: erector spinae plane block

A variety of techniques may be used for postoperative pain management following upper extremity surgery. Among these, interscalene, axillary, infraclavicular, and supraclavicular blocks may be applied as the primary intraoperative anesthetic or combined with general