Botnaald of IV toegang bij reanimatie?

Timo

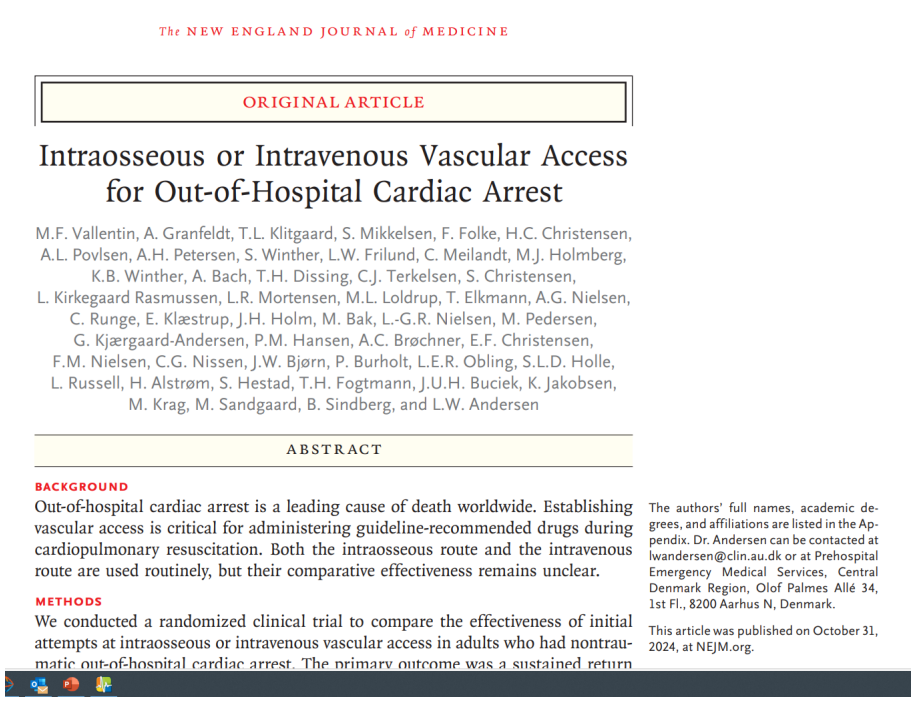
UMC Utrecht

European Resuscitation Council Cogres

2 hoogtepunten…

European Resuscitation Council Cogres

2 hoogtepunten…



The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Intraosseous or Intravenous Vascular Access for Out-of-Hospital Cardiac Arrest

M.F. Vallentin, A. Granfeldt, T.L. Klitgaard, S. Mikkelsen, F. Folke, H.C. Christensen, A.L. Povlsen, A.H. Petersen, S. Winther, L.W. Frilund, C. Meilandt, M.J. Holmberg, K.B. Winther, A. Bach, T.H. Dissing, C.J. Terkelsen, S. Christensen, L. Kirkegaard Rasmussen, L.R. Mortensen, M.L. Loldrup, T. Elkmann, A.G. Nielsen, C. Runge, E. Klæstrup, J.H. Holm, M. Bak, L.-G.R. Nielsen, M. Pedersen, G. Kjærgaard-Andersen, P.M. Hansen, A.C. Brøchner, E.F. Christensen, F.M. Nielsen, C.G. Nissen, J.W. Bjørn, P. Burholt, L.E.R. Obling, S.L.D. Holle, L. Russell, H. Alstrøm, S. Hestad, T.H. Fogtmann, J.U.H. Buciek, K. Jakobsen, M. Krag, M. Sandgaard, B. Sindberg, and L.W. Andersen

ABSTRACT

BACKGROUND

Out-of-hospital cardiac arrest is a leading cause of death worldwide. Establishing vascular access is critical for administering guideline-recommended drugs during cardiopulmonary resuscitation. Both the intraosseous route and the intravenous route are used routinely, but their comparative effectiveness remains unclear.

METHODS

We conducted a randomized clinical trial to compare the effectiveness of initial attempts at intraosseous or intravenous vascular access in adults who had nontraumatic out-of-hospital cardiac arrest. The primary outcome was a sustained return

The authors' full names, academic degrees, and affiliations are listed in the Appendix. Dr. Andersen can be contacted at lwandersen@clin.au.dk or at Prehospital Emergency Medical Services, Central Denmark Region, Olof Palmes Allé 34, 1st Fl., 8200 Aarhus N, Denmark.

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The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

A Randomized Trial of Drug Route in Out-of-Hospital Cardiac Arrest

K. Couper, C. Ji, C.D. Deakin, R.T. Fothergill, J.P. Nolan, J.B. Long, J.M. Mason, F. Michelet, C. Norman, H. Nwankwo, T. Quinn, A.-M. Slowther, M.A. Smyth, K.R. Starr, A. Walker, S. Wood, S. Bell, G. Bradley, M. Brown, S. Brown, E. Burrow, K. Charlton, A. Claxton Dip, V. Dra'gon, C. Evans, J. Falloon, T. Foster, J. Kearney, N. Lang, M. Limmer, A. Mellett-Smith, J. Miller, C. Mills, R. Osborne, N. Rees, R.E.S. Spaight, G.L. Squires, B. Tibbetts, M. Waddington, G.A. Whitley, J.V. Wiles, J. Williams, S. Wiltshire, A. Wright, R. Lall, and G.D. Perkins, for the PARAMEDIC-3 Collaborators*

ABSTRACT

BACKGROUND

In patients with out-of-hospital cardiac arrest, the effectiveness of drugs such as epinephrine is highly time-dependent. An intraosseous route of drug administration may enable more rapid drug administration than an intravenous route; however, its effect on clinical outcomes is uncertain.

METHODS

We conducted a multicenter, open-label, randomized trial across 11 emergency medical systems in the United Kingdom that involved adults in cardiac arrest for

The authors' full names, academic degrees, and affiliations are listed in the Appendix. Dr. Perkins can be contacted at g.d.perkins@warwick.ac.uk or at the Warwick Clinical Trials Unit, Warwick Medical School, University of Warwick, Gibbet Hill Rd., Coventry, CV4 7AL, United Kingdom.

*A complete list of the PARAMEDIC-3 collaborators is provided in the Supple-

PARAMEDIC 3

Methode:

The PARAMEDIC 3 trial is a pragmatic, open-label RCT from 11 EMS services in the United Kingdom.

Patienten:
Adult patients with out of hospital cardiac arrest who required vascular access for medication administration during ongoing CPR. The only exclusion was known or apparent pregnancy.

Intervention:
Intraosseous-first vascular access strategy.

Comparison:
Intravenous-first vascular access strategy.

Outcome:
The primary outcome was 30 day survival.

PARAMEDIC 3

Trial Design:

Powered to detect a 1% absolute difference in mortality. Required 15,000 patients, but stopped early due to slow recruitment and loss of funding.
Enrolled only 6,082 patients → underpowered.

Patient Demographics:

Mean age: 68 years, 65% male.
Majority of arrests at home, with bystander CPR in ~50%.20% of arrests had a shockable rhythm.

Procedural Metrics:

Median time to vascular access: 12 minutes (same in both groups).
Median time to drug administration: 14 vs. 15 minutes.
IO success rate: 95% on first attempt vs.
65% for IV, raising questions about why IO wasn't faster.

PARAMEDIC 3

Table 3. Primary and Secondary Outcomes.

Outcome	Intraosseous Route	Intravenous Route	Risk or Mean Difference (95% CI)*		Treatment Effect (95% CI)†	
			Unadjusted	Adjusted‡	Unadjusted	Adjusted
Primary outcome						
Survival at 30 days — no./total no. (%)	137/3030 (4.5)	155/3034 (5.1)	−0.6 (−1.7 to 0.5)	−0.2 (−1.1 to 0.8)	0.88 (0.70 to 1.11)	0.94 (0.68 to 1.32)§
Secondary outcomes						
Return of spontaneous circulation at any time — no./total no. (%)	1092/3031 (36.0)	1186/3035 (39.1)	−3.0 (−5.5 to −0.6)	−3.2 (−5.9 to −0.6)	0.88 (0.79 to 0.97)	0.86 (0.76 to 0.97)
Median time to return of spontaneous circulation (IQR) — min	33.0 (24.0 to 43.0)	32.0 (24.0 to 43.0)	0.76 (−1.06 to 2.58)	0.45 (−0.82 to 1.72)	0.90 (0.82 to 0.98)¶	0.89 (0.81 to 0.98)¶
Sustained return of spontaneous circulation at hospital handover — no./total no. (%)	654/3016 (21.7)	744/3023 (24.6)	−2.9 (−5.1 to −0.8)	−2.6 (−4.8 to −0.3)	0.85 (0.75 to 0.96)	0.85 (0.74 to 0.98)
Survival to hospital discharge — no./total no. (%)	112/3012 (3.7)	120/3012 (4.0)	−0.3 (−1.2 to 0.7)	0.0 (−0.9 to 0.8)	0.93 (0.72 to 1.21)	0.10 (0.68 to 1.46)
Median length of hospital stay (IQR) — days						
Patients who survived	18 (11.0 to 32.0)	16 (7.0 to 31.0)	3.12 (−4.70 to 10.94)	7.68 (−4.39 to 19.75)		
Patients who died	0 (0.0 to 0.0)	0 (0.0 to 0.0)	−0.23 (−0.48 to 0.02)	−0.18 (−0.45 to 0.10)		
Score on modified Rankin scale at hospital discharge — no./total no. (%)‖						
0–3: Favorable outcome	80/2994 (2.7)	85/2986 (2.8)	−0.2 (−1.0 to 0.7)	−0.1 (−0.8 to 0.6)	0.94 (0.69 to 1.28)	0.91 (0.57 to 1.47)
4–6: Unfavorable outcome	2914/2994 (97.3)	2901/2986 (97.2)				
Adverse events						
Any adverse event — no. per 1000 patients/total no. (%)	1/3040 (0.33)	0/3042 (0)			1.01 (0.86 to 1.18)**	
Serious adverse event — no. per 1000 patients/total no. (%)	0/3040 (0)	0/3042 (0)				

PARAMEDIC 3

For the primary outcome of 30 day survival, there was no statistical difference, with 4.5% of the IO group and 5.1% of the IV group alive (aOR 0.94, 95% CI 0.68-1.32).

Favourable neurologic outcomes were seen in 2.7% versus 2.8%. ROSC and sustained ROSC to hospital handover were both slightly higher with IV (2% absolute).

PARAMEDIC 3

Trial Limitations:

Stopped early → significantly underpowered.Target: 1% absolute difference, but observed only 0.6%, likely negative even with full enrollment.

ROSC Debate:

Pro-ROSC Argument: Any ROSC improves chances, as survival requires ROSC.Counterpoint: Without long-term survival or good neurologic outcomes, ROSC may represent harm (ICU burden, poor outcomes).Ethical Angle: Increased ROSC may enable organ donation, sparking ethical discussions.

Practical Concerns:

IO vs. IV Protocols:IO success rate was much higher (95% vs. 65%).Time to medication administration was unexpectedly similar—potential protocol delays with IO?Suggestion: Optimize IO protocols to improve outcomes.

IV-IO trial

The Methods
The IVIO trial is an open label RCT from EMS agencies in all 5 regions of Denmark.

Patients
Adult patients with out of hospital cardiac arrest and an indication for vascular access.

Intervention
Vascular access using an IO.

Comparison
Vascular access using an IV.

Shared procedures
After two failed attempts, the method used for any further attempts was at the clinician's discretion.

Outcome
The primary outcome was sustained return of spontaneous circulation (ROSC). Sustained meant a pulse that was maintained for at least 20 minutes.

IV-IO trial

Study Design:

Included 1,479 patients (mean age 70; 70% male).Most arrests occurred at home.85% received bystander CPR; 25% had shockable rhythms.

Procedural Outcomes:

IO access: 91% first attempt success vs. 63% with IV.Time to vascular access and epinephrine administration: 6 minutes for both groups.

Primary Outcome (ROSC):

No statistical difference: 30% (IO) vs. 29% (IV) (RR 1.06, 95% CI 0.9–1.24).

IV-IO trial

Secondary Outcomes:

Survival: 12% (IO) vs. 10% (IV).Neurologically intact survival: 9% (IO) vs. 8% (IV).No difference between tibial vs. humeral IO outcomes.

Key Insight:

Poor placement of humeral IO (71% verified via CT vs. 100% tibial).Raises questions about the relevance of vascular access in cardiac arrest.

IV-IO trial

Table 3. Outcomes According to Trial-Group Assignment.*

Outcome	Intraosseous Access (N=731)	Intravenous Access (N=748)	Risk Ratio (95% CI)	Difference (95% CI)
Primary outcome: sustained return of spontaneous circulation — no. (%)	221 (30)	214 (29)	1.06 (0.90 to 1.24)†	1.6 (–3.0 to 6.3)†‡
30-Day outcomes				
Survival — no. (%)§	85 (12)	75 (10)	1.16 (0.87 to 1.56)	1.6 (–1.6 to 4.8)‡
Survival with a favorable neurologic outcome — no. (%)¶	67 (9)	59 (8)	1.16 (0.83 to 1.62)	1.3 (–1.6 to 4.2)‡
EQ-5D-5L score, as assessed by the patient‖	68±20	64±21	—	4 (–2 to 11)**
EQ-5D-5L score, index value‖	63±31	63±26	—	0 (–9 to 9)**
90-Day outcomes				
Survival — no. (%)††	82 (11)	71 (10)	1.18 (0.88 to 1.60)	1.7 (–1.4 to 4.9)‡
Survival with a favorable neurologic outcome — no. (%)¶	75 (10)	64 (9)	1.20 (0.88 to 1.65)	1.7 (–1.3 to 4.8)‡
EQ-5D-5L score, as assessed by the patient‖	78±19	74±20	—	3 (–3 to 10)**
EQ-5D-5L score, index value‖	82±24	81±23	—	1 (–6 to 9)**

PARAMEDIC 3 & IV-IO trial

Primary Outcome Comparison:

The trial focused on ROSC as the primary outcome, compared to survival in PARAMEDIC3.Despite being smaller, the results align closely with PARAMEDIC3, showing consistent outcomes.

Insights on IO Usage:

IO was more successful than IV but not faster, raising questions about practical application versus real-world experience.This discrepancy challenges anecdotal perceptions of IO efficiency.

Key Takeaway:

Focus should shift from debating how to administer medications to questioning whether medications improve outcomes in cardiac arrest.Evidence for the effectiveness of medications in general cardiac arrest remains weak.

PARAMEDIC 3 & IV-IO trial

The OPALS Study (Stiell 2004):

Design: Before-and-after study of ALS paramedics in Ontario (focused on intubation and IV access).Findings: ROSC increased, but survival to discharge was unchanged.Implication: Despite no survival benefit, the costly ALS program was continued, raising questions about evidence-based decision-making.

RCTs of Medications in Cardiac Arrest:

Epinephrine: (Jacobs 2011; Perkins 2018)May improve mortality but offers no neurologic benefit and potentially causes harm by leading to poor-quality survival outcomes.Amiodaroe & Lidocaine (ALPS, Kudenchuk 2016):No benefit compared to placebo.

PARAMEDIC 3 & IV-IO trial

Vascular Access Debate:

PARAMEDIC3 and IVIO trials: No comparison to no vascular access makes it unclear if medications improve outcomes at all. IVIO-specific findings: Identical outcomes in ROSC and mortality with humeral IO access, even though only 70% of humeral IOs were correctly placed (verified by CT).

Key Takeaway:

Current evidence suggests vascular access and medications may be irrelevant in cardiac arrest. However, vascular access is crucial post-ROSC for ongoing care.

Implicaties voor de PICU WKZ

1. **Is het resultaat van de studie relevant voor PICU WKZ?**
   JA…. Maar…

2. **Indien Ja:**
   a. **Wat zou je willen implementeren voor de PICU WKZ?**

   b. **Is het nodig om een colloquium in te plannen met experts om dit vorm te geven?**