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# Resuscitation

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## Letter to the Editor

# Reply to: Are non-shockable initial rhythms always worse? Need for a detailed classification and stratified exploration of prognostic factors



To the Editor,

We would like to thank Dr. H. Mori et al. for their interest in our article “Initial rhythm and survival in refractory out-of-hospital cardiac arrest. Post-hoc analysis of the Prague OHCA randomized trial”.<sup>1</sup>

They do express some concerns. The main was related to non-shockable rhythms as comparators. The small sample size of our whole cohort, still the largest randomized population in refractory out-of-hospital cardiac arrest (OHCA) comparing standard to extracorporeal cardiopulmonary resuscitation (ECPR) based approach, did not allow for a detailed comparison between different non-shockable rhythms. However, the survival rate was very low in both non-shockable subgroups. A favorable outcome (cardiac end neurological recovery with Cerebral Performance Category 1 or 2 at 180 days) was present in 3 (out of 45) patients with initial pulseless electrical activity (PEA) and in 2 (out of 55) patients with initial asystole. More details are in [Table 1](#). The invasive strategy, including ECPR, failed in improving the patient’s prognosis, which constitutes a clinically important message of our data. This inauspicious overall prognosis was mainly given by the absence of neurological recovery. In opposite to neurological recovery, cardiac recovery was present in 6 patients with PEA and in 9 patients with asystole at 30 days.

Even though the number of patients is low, the cardiac recovery rate still seems to be comparable in both non-shockable rhythms. However, cardiac recovery was generally numerically higher with the invasive approach. This issue may be relevant when considering a non-shockable population to become candidates for organ donorship.

We fully agree with Dr. H. Mori that a later rhythm course may further stratify a patient’s prognosis in non-shockable rhythms,<sup>2–4</sup> but more robust data exists in patients with shockable rhythms.<sup>5</sup> Our analysis was originally focused to uncover the impact of pure initial rhythm. Several reasons led to this approach. The first, initial rhythm was precisely documented in the Prague OHCA Trial.<sup>6</sup> Second, in routine clinical practice, the initial rhythm is usually referred to by the emergency medical system as one of the scarce trustworthy details. It must be also commented that our cohort is different from previously referred studies.<sup>2,3</sup> The Prague study included patients with refractory cardiac arrests, lasting for more than 52 mins in the whole study.<sup>1</sup> There was also a different number of bystander cardiopulmonary resuscitation, witnessed collapses, and pre-hospital recoveries of spontaneous circulation.<sup>2,3</sup> Of note in a study published

**Table 1 – Study endpoints according to initial non-shockable rhythm and treatment strategy.**

| Initial rhythm                       | Pulseless electrical activity |                   | Asystole          |                   |
|--------------------------------------|-------------------------------|-------------------|-------------------|-------------------|
|                                      | Invasive (N = 21)             | Standard (N = 24) | Invasive (N = 31) | Standard (N = 24) |
| <b>Primary outcome</b>               |                               |                   |                   |                   |
| Survival with CPC 1 or 2 at 180 days | 3 (14%)                       | 0 (0%)            | 1 (3%)            | 1 (4%)            |
| <b>Secondary outcomes</b>            |                               |                   |                   |                   |
| Cardiac recovery at 30 days (YES)    | 4 (19%)                       | 2 (8%)            | 7 (23%)           | 2 (8%)            |
| Neuro recovery at 30 days (YES)      | 3 (14%)                       | 0 (0%)            | 1 (3%)            | 0 (0%)            |

**Note:** Data are expressed as N (%). CPC – Cerebral Performance Category.

by Zheng et al., there was a significant difference in bystander resuscitation between patients with PEA and asystole.<sup>3</sup>

In conclusion, non-shockable rhythms seem to have an inauspicious prognosis in refractory out-of-hospital cardiac arrest regardless of the strategy used. Our data have suggested that this outcome is uniform in both asystole and PEA. However, a limited number of patients with non-shockable rhythms is an important limitation of our study and further studies in this area are necessary.

## REFERENCES

1. Havranek S, Fingrova Z, Rob D, et al. Initial rhythm and survival in refractory out-of-hospital cardiac arrest. Post-hoc analysis of the Prague OHCA randomized trial. *Resuscitation* 2022. <https://doi.org/10.1016/j.resuscitation.2022.10.006>. S0300-9572(22)00685-2.
2. Cournoyer A, Cossette S, Potter BJ, et al. Prognostic impact of the conversion to a shockable rhythm from a non-shockable rhythm for patients suffering from out-of-hospital cardiac arrest. *Resuscitation* 2019;140:43–9.
3. Zheng R, Luo S, Liao J, et al. Conversion to shockable rhythms is associated with better outcomes in out-of-hospital cardiac arrest patients with initial asystole but not in those with pulseless electrical activity. *Resuscitation* 2016;107:88–93.
4. Goto Y, Maeda T, Nakatsu-Goto Y. Prognostic implications of conversion from nonshockable to shockable rhythms in out-of-hospital cardiac arrest. *Crit Care* 2014;18:528.
5. Bhandari S, Doan J, Blackwood J, et al. Rhythm profiles and survival after out-of-hospital ventricular fibrillation cardiac arrest. *Resuscitation* 2018;125:22–7.
6. Belohlavek J, Smalcova J, Rob D, et al. Effect of intra-arrest transport, extracorporeal cardiopulmonary resuscitation, and immediate invasive assessment and treatment on functional neurologic outcome in refractory out-of-hospital cardiac arrest: A randomized clinical trial. *JAMA* 2022;327:737–47.

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*Abbreviations:* OHCA, Out-of-hospital cardiac arrest, ECPR, Extracorporeal cardiopulmonary resuscitation, PEA, Pulseless electrical activity