Shock success and its determinants in refractory ventricular fibrillation during out-of-hospital cardiac arrest

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Introduction

- Optimising timing of shocks using predictors of shock success may contribute to a more personalised treatment strategy during out-of-hospital cardiac arrest (OHCA).
- Such novel treatment strategies are currently under investigation, mainly for *first* shocks on initial ventricular fibrillation (VF).
- However, the majority of patients requires additional shocks, warranting additional knowledge on predictors of *subsequent* shock success.

Aim

- We aim to investigate predictors of shock success in all subsequent shocks on VF during out-of-hospital cardiac arrest.

Methods

- From our OHCA cohort (Nijmegen, the Netherlands, 2008-2011), we selected the sub-set of patients receiving >1 shock on VF (107 patients; 342 shocks).
- As seen in Figure 1, we divided the included shocks into shocks on:
 - Recurrent VF: VF recurring after successful termination.
 - Persisting VF: VF failing to terminate by the previous shock.
- Predictors included AMSA (a VF-waveform characteristic), duration of VF-onset until shock (pre-shock VF-duration) and the number of preceding successful shocks.
- Shock success was defined as return of organised rhythm.

Results

- Shock success was higher for shocks on recurrent VF vs. persisting VF: 65% vs. 32%, $p < 0.001$.
- **Recurrent VF:** higher AMSA and increasing numbers of preceding successful shocks were independently associated with shock success (aOR 1.15 per mV·Hz, $p = 0.001$; aOR 1.43 per additional shock, $p = 0.03$).
- **Persisting VF:** longer pre-shock VF-duration was significantly associated with reduced shock success (OR 0.96 per 30s increase, $p = 0.04$).

Figure 1 – Examples of shock categories and pre-shock VF duration

S₁ = Shock on initial VF. These shocks were excluded from the present analysis.

S₂ = Shock on recurrent VF. For this shock, pre-shock VF duration = B

S₃ = Shock on persisting VF. For this shock, pre-shock VF duration = B + C

Conclusions

- This study emphasizes the importance of distinguishing different types of refractory VF, given the considerable differences in shock success and its determinants.
- Defibrillation failure for a shock on persisting VF is twice as likely as on recurrent VF.
- For persisting VF, shocks following longer VF-duration had lower defibrillation success, which warrants studies on earlier or repetitive defibrillation attempts.