Clinical features and outcomes of patients with refractory out-of-hospital cardiac arrest and an initial shockable rhythm

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Background: Clinical features of patients presenting with refractory out-of-hospital cardiac arrest (OHCA) and initial shockable rhythms of ventricular fibrillation/pulseless ventricular tachycardia (VF/pVT) remain poorly described.

Purpose: This study evaluated clinical characteristics, angiographic findings, and short-term outcomes among patients with refractory OHCA (defined as incessant VF/pVT after ≥3 direct-current shocks) compared to those without refractory OHCA.

Methods: Of 761 consecutive patients hospitalized for OHCA between 2014–2018 at two large tertiary health services in Victoria, Australia, 204 (27%) had an initial shockable rhythm and were stratified by the presence (n=74, 36%) or absence (n=130, 64%) of refractory OHCA. Primary outcome was in-hospital mortality. Multivariable logistic regression was performed to evaluate independent predictors of in-hospital mortality.

Results: The majority of patients were male (77%) and the median age was 62 years [IQR 52–72]. Refractory OHCA patients had longer cardiopulmonary resuscitation (23 vs 15 minutes), more frequently required ≥450 mg of amiodarone (34% vs 3.8%), had cardiogenic shock (80% vs 55%) necessitating higher adrenaline dose (4.0 vs 1.0 mg) and higher rates of mechanical ventilation (92% vs 74%) (all p<0.01). A total of 167 patients (82%) underwent coronary angiography, and refractory OHCA patients were less likely to be selected (74% vs 86%, p=0.035). No difference in door-to-needle times between those with and without refractory OHCA was noted (103 vs 99 minutes, p=0.586). Significant coronary artery disease (≥1 major vessel with >70% stenosis) was present in >70% of patients. Refractory OHCA group frequently had acute coronary occlusion (64% vs 47%), especially of the left circumflex artery (20% vs 6.4%) and graft vessel (7.3% vs 0.9%), and often had complex coronary lesions (type B2 or C) (57% vs 39%) compared to those without refractory OHCA (all p<0.05). Patients with both refractory OHCA and ST-elevation on electrocardiogram had the highest prevalence of acute coronary occlusion (85%, 22/26). Refractory OHCA group had higher rates of in-hospital mortality (45% vs 30%) and new requirement for dialysis (18% vs 6.3%) (all p<0.05). Among those with refractory OHCA, higher cumulative prehospital adrenaline dose (OR 1.38, 95% CI 1.01–1.89 per 1 mg increase), and increased number of direct-current shocks (1.13, 1.00–1.27 per 1 additional shock) were independent predictors of in-hospital mortality, whereas undergoing coronary revascularization (0.28, 0.09–0.94) diminished this risk (all p<0.05) (Figure 2).

Conclusion: Refractory VF/pVT OHCA was associated with more intensive resuscitation, higher rates of acute coronary occlusion and poorer in-hospital outcomes, underscoring the need for future studies in this extreme-risk subgroup.
### Figure 2: Independent predictors of in-hospital mortality for refractory OHCA group

<table>
<thead>
<tr>
<th>p-value</th>
<th>95% CI</th>
<th>OR</th>
<th>Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.007</td>
<td>1.16–2.53</td>
<td>1.71</td>
<td>Age per 10-year increase</td>
</tr>
<tr>
<td>0.043</td>
<td>1.01–1.89</td>
<td>1.38</td>
<td>Total pre-hospital adrenaline dose per 1 mg increase</td>
</tr>
<tr>
<td>0.042</td>
<td>1.00–1.27</td>
<td>1.13</td>
<td>Number of DCR attempts per 1 additional shock</td>
</tr>
<tr>
<td>0.039</td>
<td>0.09–0.94</td>
<td>0.28</td>
<td>Coronary revascularisation</td>
</tr>
</tbody>
</table>

**Caption:** CI indicates confidence interval; DCR, direct current cardioversion; OR, odds ratio.