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

W. Zheng1, F. Ho2, M. Zheng3, S. Noaman2, K. Haji2, R. Batchelor4, L. Hanson2, J. Shaw1, Y. Yang5, D. Stub1, N. Cox2, D. Kaye1, W. Chan1

1The Alfred Hospital, Department of Cardiology, Melbourne, Australia
2Western Health, Department of Cardiology, Melbourne, Australia
3University of New South Wales, School of Clinical Medicine, Sydney, Australia
4Royal Melbourne Hospital, Department of Cardiology, Melbourne, Australia
5Western Health, Intensive Care Unit, Melbourne, Australia

Funding Acknowledgements: None.

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). After adjustment, refractory OHCA heightened the risk of in-hospital mortality by over two-fold (OR 2.28, 95% CI 1.06–4.89, p=0.034) (Figure 1). 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 1: Independent predictors of in-hospital mortality for overall cohort

Caption: CI indicates confidence interval; OHCA, out-of-hospital cardiac arrest; OR, odds ratio; pVT, pulseless ventricular tachycardia; VF, ventricular fibrillation.
Figure 2: Independent predictors of in-hospital mortality for refractory ORCA group

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