Intravenous bolus administration of nicorandil improves myocardial perfusion in patients with acute ischemic heart failure

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Abstract

Purpose: Managements for acute ischemic heart failure (AIHF) is different from those of non-ischemic heart failure. Usually intravenous administration of nitrate is commonly used for management of AIHF. However, it is not well known that intravenous bolus administration of nicorandil is useful for early stage of management of AIHF. Therefore, we examined the effects of bolus administration of nicorandil on myocardial perfusion at earlier stage of AIHF management.

Methods: Changes in myocardial perfusion were examined by nicorandil-stress MIBI SPECT (99mTc-MIBI 600MBq). Nicorandil administration was made over 5 minutes. SPECT was acquired 30 minutes after administration. In 12 AIHF patients, total defect score (TDS) was evaluated with 17 segments 5-grade assessment.

Results: Significant systolic blood pressure improvement was observed. In ischemic area, TDS was significantly improved from 13±4 days after admission to 17 segments 5-grade assessment. Significant coronary stenosis assessed by coronary angiography was detected in 78% of 112 ischemic segments and 47% in 92 non-ischemic segments.

Discussion: Intravenous bolus injection of nicorandil improved myocardial perfusion in significant ischemic area, suggesting that nicorandil would be useful for the early stage of management of AIHF patients.

Background

- Managements for acute ischemic heart failure (AIHF) are different from non-ischemic heart failure. Intravenous administration of nitrate is commonly used for the management of AIHF.
- However, it is not well known that intravenous bolus administration of an ATP-sensitive potassium channel opener, nicorandil, is useful for early stage of management of AIHF.

Objective

We examined the effects of bolus administration of nicorandil on myocardial perfusion at earlier stage of AIHF management.

Figure 1 Study Protocol

- The diagnosis of ischemic heart failure was made by coronary angiography (CAG). Ischemic heart failure was defined as heart failure with significant coronary stenosis assessed by CAG.
- Total defect score (TDS) was evaluated with 17 segments 5-grade assessment and summarized in total 204 segments with and without significant stenosis assessed by coronary angiography.

Figure 2 17 segments 5-grade assessment

Table 1 Hemodynamic changes at pre and post bolus administration of nicorandil

<table>
<thead>
<tr>
<th></th>
<th>Pre administration</th>
<th>Post administration</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBP (mmHg)</td>
<td>120 ±17</td>
<td>100 ±20</td>
<td>0.001</td>
</tr>
<tr>
<td>DBP (mmHg)</td>
<td>64 ±1</td>
<td>61 ±9</td>
<td>0.161</td>
</tr>
<tr>
<td>HR (bpm)</td>
<td>70 ±12</td>
<td>78 ±16</td>
<td>0.006</td>
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</tbody>
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SBP: Systolic blood pressure, DBP: Diastolic blood pressure, HR: Heart rate.

Figure 3 Representative Case: 77y man, 3VD

- Figure 3: Representative case of a 77-year-old man.

Figure 4 The ratio of myocardial hypoperfusion segments in ischemic area and non-ischemic area

- Figure 4: The ratio of myocardial hypoperfusion segments.

- Figure 5: Improvement of TDS of nicorandil stress image and rest image.

Summary

- Hypoperfusion area of 78% in ischemic area and also 47% even in non-ischemic area were detected.
- Intravenous bolus administration of nicorandil decreased systolic blood pressure and increased heart rate significantly, but not decreased diastolic blood pressure.
- Nicorandil significantly improved myocardial perfusion in ischemic area.

Discussion

- Nicorandil has several effects for heart failure, such as improvement of coronary perfusion or microcirculation, and reduction of afterload.
- This is the first study that revealed the improvement of myocardial hypoperfusion by bolus administration of nicorandil with significant stenosis in AIHF patients.

Conclusion

Intravenous bolus injection of nicorandil improved myocardial perfusion in significant ischemic area, suggesting that nicorandil would be useful for the early stage of management for AIHF patients.