N-terminal brain natriuretic peptide and subsequent hospital admission for worsening heart failure

M R Cowie, C Metcalfe, K F Fox, G C Sutton

RESULTS
From the 332 patients enrolled, 110 samples were available for NT-proBNP measurement. Samples were not available from the other patients because of early death, refusal to have blood taken, and technical failures. Seventy one patients were male, median age was 75 years (range 49–91 years), CAD was the aetiology in 40 patients, 98 patients had impaired left ventricular systolic function, and 59 patients were NYHA rating IV at the time of first presentation. While males (65% v 54%) were over-represented, the subsample with NT-proBNP measurements was otherwise comparable to the whole study cohort. Median concentration of NT-proBNP was 637 pg/ml (90% range 110–3510 pg/ml).

Thirty patients had an unplanned admission for worsening heart failure during follow up and 17 died before such an admission. The results (table 1) show no evidence for an association between NT-proBNP concentration and subsequent hospitalisation. By contrast, despite the small number of deaths occurring without prior admission, there was strong evidence of an association between higher NT-proBNP and an increasing risk of death. The trend towards a greater hazard of the combined outcome of hospitalisation or death with higher NT-proBNP is because of the association with death.

DISCUSSION
Our results suggest that the previous study may have overestimated the relation between NT-proBNP and the subsequent risk of hospitalisation for worsening heart failure. This discrepancy may have arisen because our study is of a population based cohort of acutely ill patients with heart failure arising from a number of different aetiologies and a wide range of disease severity. Perhaps there is a stronger association in patients with specific aetiologies, such as CAD. Alternatively, the timing of NT-proBNP measurement may be an important factor in maximising its predictive value for subsequent hospitalisation. While in our study NT-proBNP was measured shortly after first diagnosis, in the study by Richards and colleagues, patients were enrolled, and their NT-proBNP measured when they were in a stable state. A recent study has addressed this issue directly, comparing measurements of NT-proBNP made on arrival at, and on discharge from, a coronary care unit. Both measurements were available for 34 patients, who subsequently experienced 19 events (death, hospital admissions for heart failure, or worsening heart failure without hospitalisation). With both measurements included in the same regression analysis, only the pre-discharge concentration of NT-proBNP was independently associated with the composite outcome. This limited evidence suggests that if the objective is to identify patients at higher risk of hospitalisation for worsening heart failure it may be important to consider the timing of measurement.

Abbreviations: BNP, brain natriuretic peptide; CAD, coronary artery disease; NYHA, New York Heart Association; NT-proBNP, N-terminal brain natriuretic peptide
risk of future hospitalisation, NT-proBNP should be measured after the patient is stabilised.

In our study we have found a strong association between NT-proBNP measured at diagnosis and subsequent survival. We suggest that the most likely reason for our failure to find a similar association with hospitalisation for worsening heart failure is the limited potential for any single patient characteristic to predict that outcome, as such admission arises through interplay of medical, social, and health service factors. We have previously found only age to be independently predictive of admission in patients with heart failure. This association is conceivably because of age acting as a marker for several factors simultaneously, such as the resilience of the patient to heart failure, and the availability of social support.

While the increasing clinical use of NT-proBNP and BNP is supported by strong associations with diagnosis and mortal-

ity, our study suggests that their value for identifying patients at risk of future hospitalisation is not yet established.

ACKNOWLEDGEMENTS

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REFERENCES

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IMAGES IN CARDIOLOGY

Left subclavian artery stenosis with subclavian–subclavian bypass

A n arch aortography demonstrates an occluded brachiocephalic trunk and subclavian–subclavian bypass graft (SSBBG) in a 56 year old woman with left main and triple coronary artery disease requiring coronary artery bypass graft (CABG) surgery. A selective left subclavian arteriography revealed a moderate stenosis with a 40 mm Hg gradient proximal to the origin of the left vertebral artery and left internal mammary artery (LIMA). Stenting of the left subclavian stenosis was performed to improve distal flow and the utilisation of LIMA during CABG. To minimise cerebral embolisation of atherosclerotic material into the left vertebral artery and right carotid through the SSSBG, left subclavian stenting was performed using induced hyperaemia of the left upper extremity and temporary manual compression of the SSSBG. The procedure was uneventful and the patient was doing well one month later.

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Table 1 Event rates for patients with NT-proBNP above and below the median value

<table>
<thead>
<tr>
<th>End points</th>
<th>Event rate for patients with NT-proBNP</th>
<th>Hazard ratio (95% CI)</th>
<th>*p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital admission†</td>
<td>Median 16/55</td>
<td>1.03 (0.79 to 1.35)</td>
<td>0.83</td>
</tr>
<tr>
<td>All cause mortality without prior</td>
<td>Median 3/55</td>
<td>1.45 (0.87 to 0.23)</td>
<td>0.016</td>
</tr>
<tr>
<td>hospital admission†</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hospital admission or all cause</td>
<td>Median 19/55</td>
<td>1.19 (0.96 to 1.48)</td>
<td>0.11</td>
</tr>
<tr>
<td>mortality†</td>
<td></td>
<td></td>
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</tbody>
</table>

*Calculated using Cox's proportional hazards regression.
†Unplanned hospital admission for worsening heart failure only.
Hazard ratios indicate the increased hazard of an event with a doubling of plasma NT-proBNP concentration at time of first presentation.

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