Hypercreatininemia and Prerenal Azotemia - Predictors of Death in Patients with Unstable Angina and Left Bundle Branch Block

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ABSTRACT

Purpose of the research: assessment of renal function in patients with UA associated with LBBB as predictor of death within 14 days after onset of the disease. Methods: The study included 56 patients with unstable angina and LBBB. Such parameters as glomerular filtration rate (GFR) and urea-creatinine ratio were calculated. The following parameters were assessed: proteinuria, low GFR hypercreatininemia, azotemia, prerenal azotemia. Results: 5 of 56 patients died during the follow-up period. Azotemia was the most frequent sign of impaired renal function in both those who died (100%) and those who survived (63%). The frequency of hypercreatininemia among those patients who died was 4.4 times higher than the frequency of hypercreatininemia among those patients who survived, the frequency of pre-renal azotemia was 2.4 times higher. Conclusion. Hypercreatininemia and prerenal azotemia are predictors of death in patients with unstable angina and LBBB within 14 days after onset of the disease.

INTRODUCTION

General state remains unstable during the first day in 16% of patients with ACS due to unstable angina (UA) [1]. UA has a more favorable life prognosis compared with MI. Yet lethal cases may accompany UA (from 1.8% to 11%) as well as adverse cardiovascular events (5.1% of cases) [2, 3, 4]. Death risk in UA is associated with such predictors as congestive heart failure, low left ventricular ejection fraction, recurrent pain syndrome, unstable hemodynamics, sustained ventricular tachycardia, etc. [1, 2, 5, 6]. The role of LBBB which occurs in 13% of patients with UA remains unclear [7]. The presence of lethal cases in patients with UA deserves more attention. There’s a need for early detection of predictors of death and perhaps more aggressive medical intervention.

The purpose of the study is to evaluate the role of renal function as predictor of mortality in patients with UA and LBBB.

MATERIALS AND METHODS

Object of the study - patients with UA and LBBB. The site for selection of patients was the Cardiology Department of the City Clinical Hospital No. 9 of the Perm city named after M.A. Tver’e (Head Doctor V.N. Petuhov, Head of Cardiological Department E.F. Varova). Dynamic type of the study was used for 14 days. The study plan was approved by the Ethics Committee of the State Budgetary Educational Institution of Higher Education “Perm State Medical Academy” of the Ministry of Health of Russian Federation (resolution from 08.02.2010, protocol number 74). Inclusion criteria were the following: patients with LBBB at any age. Exclusion criteria were the following: WPW syndrome, hyperkalemia, ventricular and nodal heart rhythm, artificial pacemaker, valvular defect, myocardial revascularization surgery (performed during current hospitalization).

Among 383 patients with unstable angina who were in the hospital, 56 patients suffering from LBBB were included in the present study. There were 27 (48%) men among them. The median age was 75 (67-81) years. According to the medical records, patients had cardiovascular disease in anamnesis (Table 1).
Table 1: Characteristics of concomitant pathology in patients.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Test group (N = 56)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stable angina (in anamnesis)</td>
<td>44 (79%)</td>
</tr>
<tr>
<td>Heart surgeries in past medical history</td>
<td>9 (16%)</td>
</tr>
<tr>
<td>Myocardial infarction</td>
<td>26 (46%)</td>
</tr>
<tr>
<td>Arral fibrillation</td>
<td>12 (21%)</td>
</tr>
<tr>
<td>Chronic heart failure</td>
<td>44 (79%)</td>
</tr>
<tr>
<td>Previous stroke</td>
<td>6 (11%)</td>
</tr>
<tr>
<td>Arterial hypertension</td>
<td>52 (93%)</td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>9 (16%)</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>16 (29%)</td>
</tr>
</tbody>
</table>

UA was diagnosed according to the recommendations of ACCF/AHA societies [8]. The diagnosis of UA was established in 12 hours after the onset of the pain syndrome with no signs of myocardial infarction. LBBB criteria were based on recommendations of American Heart Association Electrocardiography and Arrhythmias Committee [9].

Laboratory blood and urine tests were performed at the time of admission. Proteinuria was determined by the qualitative method using diagnostic test strips. Creatinine and urea plasma concentration was determined using the analyzer Architect i2000SR (produced by Abbott, USA). Normal concentration of creatinine was considered as 50-115 µmol/L, urea = 4.2-8.3 mmol/L [10]. Exceeding the normal values of creatinine and urea in blood and plasma was regarded as hypercreatininemia and azotemia, respectively. Glomerular filtration rate (GFR) was calculated by CKD-EPI formula for adults and elderly patients, taking into account the data on plasma creatinine level, age and sex of the patient [11, 12, 13]. The criterion of kidney failure was set as the decline of GFR below 90 ml/min/1.73 m² [14, 15, 16]. Also urea:creatinine (mmol/L: mmol/L) ratio was calculated. Normal urea:creatinine ratio in a healthy population was considered as 20 mmol/L: mmol/L, while urea:creatinine ratio equal to 21 mmol/L: mmol/L was considered to be a sign of prerenal azotemia (PRA) [17]. Death cases in the period of 14 days served as an endpoint of UA unfavorable outcome. Statistical analysis was performed using the software «STATISTICA 6.1» («Statsoft Inc.», 2009). Nonparametric statistical methods were used as the studied parameters hadn’t proper distribution (H. Lilliefors criterion, at p<0.05) [18]. The difference between two groups was assessed by Mann Whitney U-test, the rate difference was assessed by Z criterion. Significant differences were reported at p<0.05.

**Results:**

5 of 56 patients died during the follow-up period. We compared the renal function in both those who died and those who survived (Table2). The results showed a higher level of creatinine and urea in dead patients.

Table 2: Comparison of renal function in dead patients and those who survived.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Dead n = 5</th>
<th>Survivors n = 51</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creatinine, mmol/L</td>
<td>142.6 (132.0-142.7)</td>
<td>91.0 (70.0-106.0)</td>
<td>0.004</td>
</tr>
<tr>
<td>GFR, ml/min per 1.73 m²</td>
<td>63.2 (54.8-65.7)</td>
<td>57.5 (53.2-74.9)</td>
<td>0.920</td>
</tr>
<tr>
<td>Urea, mmol/L</td>
<td>11.0 (10.9-11.2)</td>
<td>8.9 (6.6-8.9)</td>
<td>0.018</td>
</tr>
<tr>
<td>Urea:creatinine ratio, mmol/L: mmol/L</td>
<td>95 (75-113)</td>
<td>77 (67-77)</td>
<td>0.195</td>
</tr>
</tbody>
</table>

We have carried out a comparative analysis of the frequency of signs of renal dysfunction between dead and survived patients (Table 3). Azotemia was the most frequent sign of impaired renal function both in the group of dead and survived patients, there were no differences in proportions between the groups. The frequency of hypercreatininemia among those patients who died was 4.4 times higher than the frequency of hypercreatininemia among those patients who survived, and the frequency of pre-renal azotemia was 2.4 times higher.

Table 3: The difference in proportions of signs of renal function impairments of patients who died and survived.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Number/proportion of patients who died N = 5</th>
<th>Number/proportion of patients who survived N = 51</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proteinuria</td>
<td>0%</td>
<td>11 (22%)</td>
<td>0.55</td>
</tr>
<tr>
<td>Decrease in GFR</td>
<td>2 (40%)</td>
<td>27 (53%)</td>
<td>0.93</td>
</tr>
<tr>
<td>Hypercreatininemia</td>
<td>4 (80%)</td>
<td>9 (18%)</td>
<td>0.010</td>
</tr>
<tr>
<td>Azotemia</td>
<td>5 (100%)</td>
<td>32 (63%)</td>
<td>0.24</td>
</tr>
<tr>
<td>Pre-renal azotemia</td>
<td>5 (100%)</td>
<td>21 (41%)</td>
<td>0.04</td>
</tr>
</tbody>
</table>
Discussion:

The role of renal dysfunction among other risk factors of death and adverse cardiovascular events in acute coronary syndrome is well known [19]. Hypercreatinemia and prerenal azotemia are known as predictors of adverse outcomes in some diseases. Pre-renal azotemia (urea:creatinine ratio more than 20) was the only risk factor for the subsequent hospitalization (second or more) for patients with chronic heart failure [20]. A readmission, as identified in the above-mentioned work, increased the risk of death by 6.7 times. Hypercreatininemia was an independent predictor of mortality for 2.5 years of observation of patients with compensated cirrhosis [21].

Conclusions:

Hypercreatininemia and prerenal azotemia are predictors of death in patients with unstable angina and LBBB within 14 days of the onset of the disease. The work has no grant support. No conflict of interest is claimed. The whole work (study design, data collection, analysis, and interpretation, preparation of the report, making the decision on the report submission for publication) is conducted with no sponsors’ participation. The source of funding is the E.A. Vagner Perm State Medical Academy.

Abbreviations:

ACSAcute coronary syndrome
MIMyocardial infarction
LBBB - left bundle branch block
UAunstable angina
GFRglomerular filtration rate
PRAprerenal azotemia
CRS - cardiorenal syndrome

REFERENCES


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