Cystatin C as a Marker of Renal Function in the Hypertensive and the Diabetic

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Abstract

Introduction: Plasma creatinine/creatinine clearance despite all its well-known limitations has been the analytic of choice in the assessment of renal function. However, recent findings have proposed Cystatin C (Cys C) as a better marker of the glomerular filtration rate (GFR).

Background/Objective: The aim of this study was to compare the precision and accuracy of plasma Cys C with that of plasma creatinine in the prediction of decreased renal function/GFR in patients with hypertension and diabetes.

Method: Twenty hypertensives and twenty diabetics were compared with forty age-matched healthy controls. Plasma Cys C and plasma creatinine were estimated in all study subjects and compared with the estimated GFR (eGFR) as estimated by the Cockcroft and Gault’s algorithm.

The strength of significance of correlation was assessed using Pearson correlation (a p value of < 0.05 was accepted as significant).

Results: Plasma Cys C correlated well with plasma creatinine (R = 0.757, p<0.01) and with the eGFR (R = –0.733 and –0.710 respectively; p<0.01). However, in the ROC analysis, the AUC of plasma Cys C (0.727) was found to be superior to that of plasma creatinine (0.539).

Conclusions: Plasma Cys C and plasma creatinine were well correlated in evaluating GFR in hypertensive and diabetic patients. Cys C was more closely correlated with the GFR and may therefore be a more accurate test of renal function in hypertensive and diabetic patients.

Methodology

The study was approved by the Institution Review Board of the Obafemi Awolowo University Teaching Hospitals, Ile-Ife, Nigeria, and informed consent was obtained from the patients and controls. Eighty subjects made up of 20 hypertensive and 20 diabetic patients, diagnosed within the preceding 6 -12 months were compared with 40 age-matched healthy controls. Patients on dialysis as well as obese, anemic, renal insufficient and diabetic/hypertensive patients were excluded. Plasma Cys C and plasma creatinine were estimated in all study subjects and compared with the GFR. Plasma creatinine concentration was determined using the modified kinetic Jaffe’s method. Plasma Cys C was measured using a sandwich enzyme immunoassay. Cystatin C concentrations were read off a standard curve. Within run precision correlation was coefficient of variation <5%. GFR was estimated by the Cockcroft and Gault’s algorithm.

Data was analyzed with the SPSS (Statistical Program for the Social Sciences) statistical package (version 11.0). The strength of significance of correlation was assessed using Pearson correlation (a p value of < 0.05 was accepted as significant).

Results

The receiver operative characteristic (ROC) plots for the diagnostic accuracy of plasma cys C and plasma creatinine to detect GFR at <73.5ml/min demonstrated a significant difference between their diagnostic efficiencies. The area under curve (AUC) for the cys C curve (0.727) was significantly higher than the AUC of the creatinine curve (0.539).

![FIGURE 2A: ROC curve for Plasma Cys C. AUC: 0.727](Image)

![FIGURE 2B: ROC curve for Plasma creatinine. AUC: 0.539](Image)

Table I: The mean distribution of eGFR, plasma cys C and plasma creatinine in the patients and controls. Plasma creatinine and plasma cys C were significantly higher in patients compared to controls (P<0.001).

<table>
<thead>
<tr>
<th></th>
<th>Hypertensives</th>
<th>Diabetics</th>
<th>Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plasma creatinine (umol/L)</td>
<td>126.8 ± 55.9</td>
<td>187.2±59.1</td>
<td>94.6±25.7</td>
</tr>
<tr>
<td>Plasma Cystatin C (mg/L)</td>
<td>2.24±0.79</td>
<td>2.78±0.55</td>
<td>1.18±0.59</td>
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<tr>
<td>eGFR (ml/min)</td>
<td>57.6±26.7</td>
<td>38.9±23.6</td>
<td>76.1±23.6</td>
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</table>

Conclusion

The high sensitivity and specificity of cystatin C as well as its independence of other factors including age appear to make it comparable to the estimated GFR for the detection of impairment in renal function.

References