Calculated creatinine clearance using the CKD-EPI-formula shows a reliable prediction and high correlation to 24-h urine in patients with diabetes mellitus but underrates systematically potentially leading to withdrawal or non-prescription of oral antidiabetics.

Kloos C¹, Tsitlakidis D², Müller N¹, Anschütz J¹, Klein F¹, Burghardt K¹, Schmidt S¹, Schmidt I¹, Boer K², Wolf G¹, Müller UA¹
¹University Hospital, Department of Internal Medicine III, Jena, Germany
²Institute for Clinical Chemistry, University Hospital Jena, Jena

Introduction

To reliably assess the glomerular filtration rate is of vital importance if oral antidiabetics are part of the therapy. We compared the CKD-EPI model, a clinically established calculation model to assess creatinine clearance (CreaClear) with specimens from 24-h urine.

Method

Inpatients with Diabetes mellitus (DM) of a university hospital received a 24-h urine collection (24hClear) to assess the CreaClear. Since mid 2013 calculated CreaClear using the CKD-EPI-formula (EPI) is available. From the years 2014 and 2015 CreaClear of a total of 615 patients was assessed simultaneously with both methods. Implausible collection specimens (creatinine excretion in 24-h collection <8 or >22mmol/24h) were not included (n=268), as well as patients with an unclear type of DM (n=6). Correlation (Cor) was calculated (Pearson, significance level p<0.01) and mean values (MV) compared with the T-test (significance level p<0.05)

Results

341 persons were analyzed (n=120 diabetes type 1 (DM1), n=285 type 2 (DM2), n=12 pancreas diabetes (DMpankr). 74(18%) had a 24hClear in the range from 40 to 60 ml/min (DM1 16%, DM2 81%, DMpankr 3%). Mean values and correlations are displayed in Table 1.

In regression analysis 24-h creatinine excretion is negatively associated with an overestimation of EPI (p<0.001).

Table 1: Comparison of measured and calculated Creatinine-Clearance

<table>
<thead>
<tr>
<th></th>
<th>EPI (SD) ml/min</th>
<th>24hClear (SD) ml/min</th>
<th>Correlation</th>
<th>Δ (ml/min)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>62.8(32.4)</td>
<td>75.1(37.3)*</td>
<td>0.88</td>
<td>12.3</td>
</tr>
<tr>
<td>DM1</td>
<td>82.1(32.2)</td>
<td>94.7(38.2)*</td>
<td>0.83</td>
<td>12.6</td>
</tr>
<tr>
<td>DM2</td>
<td>54.1(29.2)</td>
<td>66.0(33.8)*</td>
<td>0.87</td>
<td>11.9</td>
</tr>
<tr>
<td>DMpankr</td>
<td>75.8(23.8)</td>
<td>97.1(26.5)*</td>
<td>0.85</td>
<td>21.3</td>
</tr>
</tbody>
</table>

* p < 0.001

Conclusions

Calculated values of creatinine clearance by the CKD-EPI-formula compared to values from 24-h urine collection retrieved from routine data of a hospital demonstrated a high correlation. CKD-EPI produced lower values in 80% of the cases underrating in the range from 11(DM2) to 21(DMpancr) ml/min. Relying on CKD-EPI may lead in the therapeutically critical range of 40 to 60 ml/min creatinine clearance to withdrawal or non-prescription of oral antidiabetics, offers on the other hand a “buffer”, which may prevent drug induced complications. The relatively large difference of both methods for persons with pancreas diabetes is caused by the reduced muscle mass in those.