Diagnosis and management of acute kidney injury in patients with cirrhosis: revised consensus recommendations of the International Club of Ascites

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Traditional diagnostic Criteria of ARF 1996

• Increase in serum creatinine (sCr) of ≥50% from baseline to a final value >133 mmol/L.

• New definitions for ARF called Akute Kidney Injury (AKI) in non cirrhotic Patients.

• 2012 ICA → New definitions of AKI in Pat. with cirrhosis.
Problems

• **sCr** ➔ most practical Biomarker but has many limitations

  • bodyweight, race, age, and gender.
  • decreased formation of creatinine from creatine in muscles, secondary to muscle wasting;
  • Increased renal tubular secretion of creatinine;
  • Increased volume of distribution in cirrhosis that may dilute sCr;
  • Interference with assays for sCr by elevated bilirubin.

  Overestimation of GFR

• fixed threshold does not take into account the dynamic changes
<table>
<thead>
<tr>
<th>RIFLE criteria</th>
<th>AKIN criteria</th>
<th>KDIGO criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diagnostic criteria</strong></td>
<td>Increase in sCr by $\geq 0.3$ mg/dL (26.5 $\mu$mol/L) within 48 h; or Increase in sCr $\geq 1.5$ times baseline within 48 h; or Urine volume $&lt;0.5$ mL/kg/h for 6 h</td>
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</tr>
<tr>
<td><strong>Stage</strong></td>
<td>Stage 1: sCr increase 1.5–1.9 times baseline; or sCr increase $\geq 0.3$ mg/dL (26.5 $\mu$mol/L); or Urine output $&lt;0.5$ mL/kg/h for 6 h</td>
<td>Stage 1: sCr increase 1.5–1.9 times baseline; or sCr increase $\geq 0.3$ mg/dL (26.5 $\mu$mol/L); or Urine output $&lt;0.5$ mL/kg/h for 6–12 h</td>
</tr>
<tr>
<td><strong>Risk:</strong></td>
<td>Stage 2: sCr increase 2.0–2.9 times baseline; or GFR decrease 50–75%; or Urine output $&lt;0.5$ mL/kg/h for 12 h</td>
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</tr>
<tr>
<td><strong>Injury:</strong></td>
<td>Stage 3: sCr increase $\geq 3.0$ times baseline; or GFR decrease $\geq 50$%; or sCr increase $\geq 4.0$ mg/dL (353.6 $\mu$mol/L) with an acute increase of at least $0.5$ mg/dL (44 $\mu$mol/L); or Urine output $&lt;0.3$ mL/kg/h for $\geq 24$ h; or Anuria for $\geq 12$ h</td>
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AKIN, Acute Kidney Injury Network; GFR, glomerular filtration rate; KDIGO, Kidney Disease Improving Global Outcome; RIFLE, Risk, Injury, Failure, Loss, End stage renal disease; sCr, serum creatinine.
Differences

• an absolute increase in sCr is considered

• the threshold of sCr ≥ 133 µmol/L is abandoned

• a staging system of AKI based on a change in sCr over a slightly longer time frame is introduced
AKIN-Criteria in patients with cirrhosis

- Validated

- Association with mortality

- Correlation of progression of AKI through the stages with increased mortality

- Even a small increase in sCr should be identified as early as possible for potential early interventions
Why do we need to change the conventional Criteria for AKI?

- New AKI Definition:
  - increase in sCr ≥ 26.5 mmol/l and/or ≥50% from baseline

- ICU transfer, longer hospital stay, in-hospital as well as 90-day and mid-term mortality

- Problem: Urine output in cirrhotic Patients

→ Introduction of the new ICA-Criteria (modified KDIGO)
### ICA-AKI

**Table 2** International Club of Ascites (ICA-AKI) new definitions for the diagnosis and management of AKI in patients with cirrhosis

<table>
<thead>
<tr>
<th>Subject</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline sCr</td>
<td>A value of sCr obtained in the previous 3 months, when available, can be used as baseline sCr. In patients with more than one value within the previous 3 months, the value closest to the admission time to the hospital should be used. In patients without a previous sCr value, the sCr on admission should be used as baseline.</td>
</tr>
<tr>
<td>Definition of AKI</td>
<td>Increase in sCr ≥0.3 mg/dL (≥26.5 μmol/L) within 48 h; or a percentage increase sCr ≥50% from baseline which is known, or presumed, to have occurred within the prior 7 days.</td>
</tr>
<tr>
<td>Staging of AKI</td>
<td>Stage 1: increase in sCr ≥0.3 mg/dL (26.5 μmol/L) or an increase in sCr ≥1.5-fold to twofold from baseline. Stage 2: increase in sCr &gt;two to threefold from baseline. Stage 3: increase of sCr &gt;threefold from baseline or sCr ≥4.0 mg/dL (353.6 μmol/L) with an acute increase ≥0.3 mg/dL (26.5 μmol/L) or initiation of renal replacement therapy</td>
</tr>
<tr>
<td>Progression of AKI</td>
<td>Progression of AKI to a higher stage and/or need for RRT</td>
</tr>
<tr>
<td>Response to treatment</td>
<td>No response                                                                                                                   Partial response                                                                                               Regression of AKI stage with a reduction of sCr to ≥0.3 mg/dL (26.5 μmol/L) above the baseline value</td>
</tr>
<tr>
<td></td>
<td>No regression of AKI                                                                                                          Full response                                                                                                  Return of sCr to a value within 0.3 mg/dL (26.5 μmol/L) of the baseline value</td>
</tr>
</tbody>
</table>

AKI, acute kidney injury; RRT, renal replacement therapy; sCr, serum creatinine.

- Urine output was removed
- MDRD formula was not included.
Definition of Baseline sCr

- Hospital acquired AKI vs. community-acquired AKI

- How far back can a value be retrieved and be valid?

- General population vs. Pat. with cirrhosis

→ Ideal 1 week before admission but not always feasible. Alternatively until 3 months before admission
What if there is no previous sCr?

• MDRD formula

• may underestimate the actual GFR in healthy patients by up to 29%.

• only for chronic kidney disease, not accurate for acute renal failure.

➔ Use sCr on admission
New algorithm for the management of AKI in patients with cirrhosis

Stage 1 AKI #

Close monitoring
Remove risk factors (withdrawal of nephrotoxic drugs, vasodilators and NSAIDs, decrease/withdrawal of diuretics, treatment of infections* when diagnosed), plasma volume expansion in case of hypovolemia

Resolution

Stable

Progression

Close follow up

Stage 2 and 3 AKI #

Withdrawal of diuretics (if not withdrawn already) and volume expansion with albumin (1g/kg) for 2 days

Response

YES

NO

Meets criteria of HRS

NO

YES

Specific treatment for other AKI phenotypes

Vasoconstrictors and albumin

Further treatment of AKI decided on a case-by-case basis §
Need to change the diagnostic criteria of HRS in the setting of AKI?

- HRS Type 1: sCr must double to a value >221 mmol/L in 2 weeks for the diagnosis of type 1 HRS.

- Does not allow for earlier treatment

- ↑ sCr → ↓ response to terlipressin
Patients who meet all other diagnostic criteria of HRS should receive vasoconstrictors and albumin, irrespective of the final value of sCr.
Response to treatment of HRS

• Full response: return of sCr to a value within 26.5 µmol/L of the baseline value

• Partial response: a regression of at least one AKI stage with a fall in the sCr value to ≥26.5 µmol/L above the baseline value.
Take away message

• New algorithm allows for faster recognition of AKI and treatment

• Dynamic changes of sCr are now taken into consideration

• Baseline sCr

• Cut-off Value in HRS type I in the setting of AKI is abandoned

• Even a small increase in sCr should be identified as early as possible for potential early interventions
Vielen Dank für Ihre Aufmerksamkeit