Contrast-induced kidney injury (CI-AKI) in patients undergoing CT angiography for pre-procedural planning of transcatheter aortic valve replacement (TAVR): incidence and risk factors
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The authors have no financial disclosures.

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RESEARCH OBJECTIVES

Determine the incidence of contrast-induced AKI in patients undergoing CT angiography for pre-TAVR planning

Quantify risk factors for AKI in this population

Risk stratify patients according to baseline eGFR
1/8 of people over 75 years old have moderate to severe aortic stenosis\textsuperscript{1}

Many TAVR candidates are too high-risk for surgery and have multiple medical comorbidities\textsuperscript{2}

Contrast-enhanced CT angiography with ECG-gating allows visualization and measurement of the oval-shaped aortic annulus during both systole and diastole\textsuperscript{3,4}
DEFINITION OF CONTRAST-INDUCED AKI

25% relative increase or
0.5 mg/dL absolute
increase in serum
creatinine within 48 hours\(^5\)
METHODOLOGY

754 patients receiving iodinated contrast agent for CT angiography at Northwestern Memorial Hospital between June 2008 and July 2017

59 patients excluded due to incomplete records or lack of follow-up

The following predictor variables were assessed: contrast dose, baseline eGFR, BMI, age, comorbidities (diabetes mellitus, hypertension), Charlson comorbidity index$^6$.
## PATIENT DEMOGRAPHICS

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>The mean age was 79, with 51% of patients being 80 years and older</td>
<td></td>
</tr>
<tr>
<td>Prevalence of type II diabetes mellitus:</td>
<td>41%</td>
</tr>
<tr>
<td>Sex:</td>
<td>54% male, 46% female</td>
</tr>
<tr>
<td>Prevalence of hypertension:</td>
<td>95%</td>
</tr>
<tr>
<td>Mean baseline eGFR:</td>
<td>57.9 +/- 22.0 mL/min/1.73 m²</td>
</tr>
<tr>
<td>Mean Charlson comorbidity index:</td>
<td>5.2 +/- 2.8</td>
</tr>
</tbody>
</table>
## RESULTS: AKI VS. NON-AKI GROUPS

### Table 1: Comparison of predictors between AKI and non-AKI groups

<table>
<thead>
<tr>
<th></th>
<th>AKI</th>
<th>No AKI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contrast dose (gm. Iodine)</td>
<td>34.2 +/- 1.7</td>
<td>31.2 +/- 0.4</td>
<td>0.043***</td>
</tr>
<tr>
<td>Baseline eGFR (mL/min/1.73 m²)</td>
<td>50.5 +/- 3.6</td>
<td>61.2 +/- 0.8</td>
<td>0.003***</td>
</tr>
<tr>
<td>Age (years)</td>
<td>77.6 +/- 2.2</td>
<td>78.2 +/- 0.4</td>
<td>0.290</td>
</tr>
<tr>
<td>Sex (% male)</td>
<td>53.9%</td>
<td>56.1%</td>
<td>0.795</td>
</tr>
<tr>
<td>Diabetes mellitus (% patients)</td>
<td>48.8%</td>
<td>43.9%</td>
<td>0.289</td>
</tr>
<tr>
<td>Hypertension (% patients)</td>
<td>90.2%</td>
<td>96.5%</td>
<td>0.178</td>
</tr>
<tr>
<td>Charlson comorbidity index</td>
<td>5.8 +/- 0.4</td>
<td>5.5 +/- 0.1</td>
<td>0.167</td>
</tr>
</tbody>
</table>

*Unpaired t-test used for continuous variables (e.g. contrast volume, baseline eGFR, age, Charlson comorbidity index)

**Chi Square test used for dichotomous variables (e.g. sex, diabetes, hypertension, diabetes mellitus)

*** statistically significant (p<0.05)
Fifty-four patients had an AKI (overall incidence: 7.2%).

In the group with baseline eGFR < 30 mL/min/1.73 m², 20.3% of patients had an AKI.

Patients in the AKI group were found to have significantly lower baseline eGFR and received higher doses of contrast (p<0.05).
RISK STRATIFICATION AND ANALYSIS

Patients sub-categorized for AKI risk analysis (logistic regression):

- eGFR < 30 mL/min/1.73 m²
- eGFR 30-60 mL/min/1.73 m²
- eGFR > 60 mL/min/1.73 m²
# RESULTS: RISK STRATIFICATION

## Incidence and risk ratio (RR) for AKI for sub-groups

<table>
<thead>
<tr>
<th>GFR (mL/min/1.73 m²)</th>
<th>Total patients (n = 754)</th>
<th>With AKI (n = 54)</th>
<th>Percent with AKI</th>
<th>RR of AKI(^1)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;30</td>
<td>64</td>
<td>13</td>
<td>20.3%</td>
<td>3.57 (2.19 – 5.82)</td>
<td>0.01</td>
</tr>
<tr>
<td>30-60</td>
<td>400</td>
<td>25</td>
<td>6.3%</td>
<td>1.89 (1.15 – 3.08)</td>
<td></td>
</tr>
<tr>
<td>&gt;60</td>
<td>290</td>
<td>16</td>
<td>5.5%</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) RR of AKI reported relative to patients with GFR > 60 mL/min/1.73 m²
CONCLUSION

Contrast-induced AKI is more common in patients with poor baseline kidney function

Patients receiving minimal contrast doses still have a significant rate of AKI

Further work is needed to balance contrast dosing to optimize the tradeoff between image quality and patient safety
REFERENCES


