# Cardiovascular screening in chronic kidney disease subjects waiting for transplantation: Unresolved question

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In patients with chronic kidney disease (CKD), cardiovascular diseases pose a significant threat. About half of deaths and over 30% of hospital admissions are attributed to cardiovascular issues. Compared to the general population, CKD patients face a 3-fold higher risk of acute myocardial infarction and a 20-fold higher risk of cardiovascular death before reaching the uremic stage [1]. Interestingly, myocardial infarction often precedes angina pectoris in CKD patients, frequently without ST-segment elevation. A 10 ml/min reduction in glomerular filtration rate increases mortality risk by 10%, and prognosis worsens after dialysis initiation [1]. In 2018, annual myocardial infarction incidence was 12% for peritoneal dialysis and 14% for hemodialysis patients [1]. Pre-transplant evaluation is crucial for selecting coronary-risk patients, but the optimal approach remains controversial, with guidelines often based on expert opinions rather than randomized data [2].

The authors of "High-sensitivity cardiac troponin T in detecting obstructive coronary artery disease in hemodialysis patients listed for kidney transplantation" recently published in *Kardiologia Polska* (*Polish Heart Journal*) should be credited for trying to shed light on how to screen for obstructive coronary artery disease in subjects receiving dialysis and listed for kidney transplantation. Szramowska and colleagues [3] suggest using cardiac troponin as a tool to assess the risk of obstructive coronary artery disease and to prevent unnecessary coronary angiography. According to the reported results, angiography should not be performed in individuals with normal troponin levels and younger than 52 years [3].

While of interest, these results are preliminary and far from conclusive due to the small sample size that limits that study. Of the initial 485 consecutive patients with CKD, the data of only 100 patients with abnormalities on echocardiography or exercise perfusion heart scintigraphy were used for the current analysis. One may wonder if the excluded patients are like those in the analysis [3]. Also, the study was conducted between 2014 and 2017, and preventive cardiology advancements may have yet to be accounted for in current analyses [3]. Nevertheless, the study highlights essential gaps in the current understanding of heart disease in CKD patients and the need for *ad hoc* and adequately designed studies to determine how to assess the coronary risk in this specific high-risk population [2].

Available guidelines [4–6] suggest using different, non-invasive techniques to assess the presence of obstructive coronary artery disease suitable for reperfusion before kidney transplantation. To avoid unnecessary invasive testing, the most recent guidelines, issued in 2020 by the Kidney Disease Improving Global Outcomes (KDIGO) [4], recommend the use of myocardial scintigraphy or pharmacological stress echocardiography in the preoperative evaluation of CKD patients with diabetes mellitus, a history of ischemic heart disease, or if at least two of the following characteristics are present: age >45 and 55 years in men and women, ischemic disease in a first-degree relative, smoking, hypertension, cholesterol

>200 mg/dl, high-density lipoprotein <35 mg/dl, or in the case of left ventricular hypertrophy. If the non-invasive test is positive for myocardial ischemia, the patient should undergo invasive coronary angiography for potential revascularization before transplantation.

Given that kidney transplantation represents a surgical intervention at intermediate risk [5], the American Heart Association and the American College of Cardiology recommend not performing a non-invasive cardiac evaluation if the patient shows a good functional status (≥4 MET) and does not have symptoms.

This uncertainty regarding the best course of action to assess obstructive coronary disease is further highlighted in the work of Szramowska et al.[3]. Indeed, of 100 subjects with an indication for angiography, only about one in two subjects studied had obstructive coronary artery disease. Other lines of evidence suggest that while both angiography and myocardial scintigraphy are good predictors of both death and cardiovascular complications, single photon emission computed tomography shows low sensitivity (53%) and modest specificity (82%) in detecting coronary stenosis ≥50% [7, 8]. The reasons for the poor accuracy of non-invasive techniques in detecting coronary perfusion anomalies in CKD patients are several-fold and need to be understood entirely. Endothelial dysfunction and arterial stiffness, the severity of the coronary artery disease, and vascular calcification often seen in CKD, as well as the presence of an artery-venous fistula for hemodialysis or anemia may account for some of the myocardial perfusion defects detected by myocardial scintigraphy or echocardiography in the absence of obstructive coronary disease [9–12].

Given the limitations and heterogeneity of available studies, Szramowska et al. [3] propose a simple and easily applicable algorithm to stratify the risk of obstructive coronary artery disease in patients with CKD and abnormalities on echocardiography or myocardial scintigraphy. The algorithm encompasses age and high-sensitivity troponin. According to the study results, subjects younger than 52 years and with troponin levels below 0.069 (about 35% of the study cohort) should not undergo coronary angiography. All other subjects (about 75% of the study cohort) should instead receive invasive testing, reducing the number of unnecessary tests.

These results should be validated in more extensive and contemporary cohorts and interpreted in the context of the aging population of CKD patients and the uncertain benefit of revascularization in advanced CKD. However, although registry data suggest that patients receiving dialysis are progressively older, using these simple criteria (age and troponin) could spare some useless and potentially dangerous procedures for the youngest individuals receiving dialysis. Indeed, the recent ISCHEMIA-CKD study showed that coronary revascularization does not reduce mortality or nonfatal myocardial infarction in nephropathic patients,

further questioning the utility of coronary angiography in asymptomatic subjects undergoing intermediate-risk surgical interventions [13].

In conclusion, Szramowska and colleagues [3] should be credited for their efforts to shed light on the vexing question of how to assess the preoperative cardiovascular risk of CKD patients receiving dialysis. However, future studies are required to validate the proposed approach in clinical practice.

### *Article information*

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