Identifying rapid progressors in ADPKD: The Mayo imaging classification in practice

Written by The Life Science Feed Editorial Team · Edited by Mara Voss

> Autosomal dominant polycystic kidney disease (ADPKD) presents a significant clinical challenge, with its relentless progression often leading to end-stage kidney disease. Identifying which patients will experience rapid decline versus those with a more indolent course is critical for timely intervention and resource allocation. The Mayo imaging classification offers a structured approach to this stratification.

KEY TAKEAWAYS

- The Pivot: The Mayo imaging classification provides a validated method to predict ADPKD progression, moving beyond age and creatinine alone.
- The Data: Total kidney volume (TKV) and its growth rate are central to classifying patients into risk categories.
- The Action: Clinicians should integrate TKV assessment into their ADPKD management, particularly for patients being considered for disease-modifying therapies.

Autosomal dominant polycystic kidney disease is the most common inherited kidney disorder, affecting millions globally. It is characterized by the development and growth of numerous fluid-filled cysts in the kidneys, leading to progressive enlargement of the organs and eventual loss of renal function. The disease is highly variable in its presentation and progression, with some patients experiencing kidney failure in their 40s or 50s, while others maintain relatively stable kidney function well into old age. This variability has historically complicated prognostication and the selection of patients for targeted therapies.

Before the advent of advanced imaging and predictive models, clinicians relied primarily on age at diagnosis, family history of kidney failure, and the rate of decline in estimated glomerular filtration rate (eGFR) to gauge prognosis. But these markers often proved insufficient for early identification of rapid progressors, particularly in younger patients with preserved kidney function. The need for a more precise, early prognostic tool became evident as disease-modifying therapies began to emerge, necessitating better patient stratification for clinical trials and, eventually, for clinical practice.

The Role of Total Kidney Volume

The Mayo imaging classification was developed to address this unmet need, leveraging the strong correlation between total kidney volume (TKV) and the rate of kidney function decline in ADPKD. TKV, measured by magnetic resonance imaging (MRI) or computed tomography (CT), serves as a robust biomarker for disease severity and progression. The premise is straightforward: larger kidneys, particularly those with rapidly growing cysts, indicate a more aggressive disease course.

The classification system categorizes patients into five classes (1A to 1E), based on their height-adjusted TKV (Ht-TKV) and age. Class 1A represents patients with slowly progressive disease, characterized by relatively small kidneys for their age. At the other end of the spectrum, Class 1E identifies patients with very large kidneys and a high likelihood of rapid progression to end-stage kidney disease. Intermediate classes (1B, 1C, 1D) delineate increasing risk levels.

Applying the Classification in Practice

For a patient to be classified, a baseline TKV measurement is essential. This is typically performed using cross-sectional imaging, with MRI being preferred due to its lack of ionizing radiation, especially for younger patients requiring serial measurements. The Ht-TKV is then calculated by dividing the TKV by the patient's height, normalizing for body size. This normalized value is plotted against age on specific nomograms to assign the patient to one of the five classes.

A patient in Class 1A, for example, might have an Ht-TKV below the 30th percentile for their age, indicating a low risk of progression. Conversely, a patient in Class 1E would have an Ht-TKV above the 90th percentile, signaling a high risk. This objective, quantitative assessment provides a more granular understanding of individual patient risk than traditional clinical markers alone. The classification helps identify patients who may benefit most from early intervention with disease-modifying therapies, such as vasopressin V2 receptor antagonists, which aim to slow cyst growth and preserve renal function. For a deeper dive into how imaging informs other renal conditions, consider the role of imaging in APOL1 kidney decline.

Beyond Baseline: Tracking Progression

While a single baseline TKV measurement is valuable, serial measurements can further refine prognostic accuracy by assessing the rate of TKV growth. A rapid increase in TKV over time, even within the same Mayo class, can indicate an accelerating disease trajectory. This dynamic assessment helps clinicians monitor treatment efficacy and adjust management strategies as needed. The frequency of TKV measurements depends on the patient's initial risk classification and clinical context, but generally, repeat imaging every 1 to 3 years is considered appropriate for those at higher risk or on active therapy.

The classification also plays a role in stratifying patients for clinical trials, ensuring that studies enroll homogeneous populations with a similar risk of progression. This improves the power of trials to detect treatment effects and accelerates the development of new therapies. Without such a classification, trials might include too many slow progressors, diluting any potential benefit of an investigational drug. The Oxford Handbook of Nephrology and Hypertension provides comprehensive guidance on these and other aspects of renal disease management.

Limitations and Evolving Perspectives

Despite its utility, the Mayo imaging classification is not without limitations. The primary caveat is its reliance on imaging, which can be costly and may not be universally accessible, particularly in resource-limited settings. There is also variability in TKV measurement techniques and interpretation across different imaging centers, necessitating standardization protocols to ensure consistency. The classification primarily focuses on kidney volume, but other factors, such as the presence of macroscopic hematuria, kidney stones, or recurrent infections, can also influence disease progression and patient outcomes, even if they do not directly impact TKV.

But the system does not account for genetic modifiers beyond the primary PKD1 or PKD2 mutations, which can also influence disease severity. Genetic testing can provide additional prognostic information, but it is not routinely integrated into the Mayo classification. The classification also does not directly incorporate extra-renal manifestations of ADPKD, such as liver cysts or intracranial aneurysms, which are significant contributors to patient morbidity and mortality. These are important considerations for comprehensive patient care, even if they fall outside the direct scope of kidney volume assessment.

The classification is most predictive in younger patients with preserved kidney function, where TKV growth is a strong indicator of future decline. In older patients or those with advanced kidney disease, the predictive power may diminish as other factors, such as hypertension and proteinuria, become more dominant drivers of progression. Still, the Mayo classification remains a cornerstone for risk stratification in ADPKD, providing a framework for personalized medicine in this complex genetic disorder. It has enabled a more proactive approach to ADPKD management, shifting the focus from reactive treatment of complications to early intervention aimed at slowing disease progression. This proactive approach is critical for improving long-term outcomes for patients. The ongoing refinement of imaging techniques and the integration of new biomarkers will likely further enhance our ability to identify and manage rapid progressors in ADPKD, building on the foundation laid by the Mayo classification.

CLINICAL IMPLICATIONS

The Mayo imaging classification has fundamentally altered how clinicians approach ADPKD, moving from a reactive stance to a proactive one. It provides a tangible, objective measure that allows for early identification of patients at high risk of rapid progression, long before significant eGFR decline manifests. This early insight is invaluable for initiating disease-modifying therapies at a stage where they can have the most impact, potentially delaying the onset of end-stage kidney disease by years.

For nephrologists, integrating TKV assessment into routine practice is no longer optional; it is a standard of care for appropriate patient selection. The classification helps to avoid overtreating slow progressors while ensuring that those who truly need intervention receive it. This targeted approach optimizes resource utilization and minimizes unnecessary exposure to medications with potential side effects.

But the practicalities of widespread implementation remain. Access to high-quality MRI or CT imaging and expertise in TKV measurement can be uneven. Standardizing these processes and ensuring consistent interpretation across different centers will be essential for the classification to reach its full potential in improving patient outcomes globally. The next step involves refining these tools further, perhaps integrating genetic data or other biomarkers to create an even more precise prognostic model.

REFERENCES

1. 1. Wolff CA, Aiello V, Elhassan EAE, et al. Integrated Use of Autosomal Dominant Polycystic Kidney Disease Prediction Tools for Risk Prognostication. Clin J Am Soc Nephrol. 2025;20(3):397-409. doi:10.2215/CJN.0000000625

2.

2. Chebib FT, Torres VE. Assessing Risk of Rapid Progression in Autosomal Dominant Polycystic Kidney Disease and Special Considerations for Disease-Modifying Therapy. Am J Kidney Dis. 2021;78(2):282-292. doi:10.1053/j.ajkd.2020.12.020

3. 3. Naranjo J, Furlano M, Torres F, et al. Comparative analysis of tools to predict rapid progression in autosomal dominant polycystic kidney disease. Clin Kidney J. 2022;15(5):912-921. doi:10.1093/ckj/sfab293

LICENCE & RIGHTS

MEDICAL DISCLAIMER

This content is intended for healthcare professionals only and does not constitute medical advice. Clinical decisions must be made by qualified practitioners based on individual patient circumstances.

FOLLOW THE LIFE SCIENCE FEED

Instagram @lifesciencefeed **LinkedIn** linkedin.com/company/thelifesciencefeed

thelifesciencefeed.com