CONDITION

Autosomal dominant tubulointerstitial kidney disease

Learn how autosomal dominant tubulointerstitial kidney disease affects kidney function, how genetic testing supports diagnosis, and how complications are monitored and treated.

WHAT IT IS
Rare inherited disorders causing progressive kidney function loss

BODY SYSTEM
Urinary system

MAIN SYMPTOMS
Frequent urination, increased thirst, gout, tiredness

WHAT CAUSES IT
Inherited genetic changes

HOW IT IS DIAGNOSED
Genetic testing

MAIN TREATMENT
Supportive kidney care and complication treatment

CAN IT BE CURED?
No, most genetic causes remain uncorrected

IS IT AN EMERGENCY?
Sometimes, severe shortness of breath

LONG-TERM OUTLOOK
Progressive chronic kidney disease may lead to kidney failure

Overview

Autosomal dominant tubulointerstitial kidney disease, or ADTKD, is a group of rare inherited disorders that gradually reduce kidney function. These disorders mainly damage the kidney tubules and surrounding tissue. Tubules help control water, salts, acid balance, and waste removal.

"Autosomal dominant" describes how the condition is inherited. A person with a disease-causing genetic variant usually has a 50% chance of passing that variant to each biological child. The condition can affect all sexes. Its severity and age of onset may differ greatly, even among relatives with the same genetic change.

ADTKD usually causes chronic kidney disease over many years. Chronic kidney disease means that the kidneys are damaged or do not filter blood as well as expected for at least three months. Some people develop reduced kidney function during childhood or early adulthood, while others are not identified until later in life.

Unlike some other inherited kidney diseases, ADTKD often causes little blood or protein in the urine. Kidney imaging may also be normal early on. These features can make the condition difficult to recognize without a careful family history and genetic testing.

Several genes can be involved. The best-established forms include ADTKD caused by variants in UMOD , MUC1 , and REN . Variants in HNF1B can produce a related kidney disorder, often with effects on other organs. Classification continues to develop as researchers identify additional genetic causes.

ADTKD matters because early recognition can guide kidney monitoring, treatment of complications, family counseling, and decisions about living kidney donation. There is not yet a treatment that corrects most underlying genetic changes, but supportive care can protect health and prepare people for advanced kidney disease if it develops.

Symptoms

Many people have no clear symptoms during the early stages. Reduced kidney function may first appear on blood tests performed for another reason or during screening because a relative has kidney disease.

Possible features include:

The pattern can depend partly on the gene involved.

UMOD-related ADTKD often causes high uric acid and gout, sometimes beginning in adolescence or early adulthood. Gout does not occur in everyone.

MUC1-related ADTKD usually causes slowly progressive kidney disease without a distinctive set of symptoms. Blood and protein levels in the urine are often low.

REN-related ADTKD may cause anemia during infancy or childhood, mildly low blood pressure, high blood potassium, or mild excess acid in the blood. Kidney function may worsen during dehydration or illnesses involving vomiting or diarrhea. Gout can develop later.

HNF1B-related disease can involve abnormal kidney development, kidney cysts, diabetes, low blood magnesium, liver test abnormalities, or differences in the reproductive tract. The combination varies from person to person.

These symptoms are not unique to ADTKD. Gout, anemia, cysts, and reduced kidney function

have many possible causes, so evaluation is needed before drawing conclusions.

- Frequent urination, especially at night
- Increased thirst or difficulty tolerating dehydration
- Gout, which causes sudden pain, redness, and swelling in a joint
- High uric acid levels in the blood
- Tiredness related to anemia or reduced kidney function
- Loss of appetite, nausea, itching, or swelling in advanced kidney disease

Causes and risk factors

ADTKD is caused by a disease-associated change in a gene that is important to kidney structure or function.

In UMOD-related disease , altered uromodulin protein builds up within kidney cells instead of being processed normally. Over time, this can injure tubules and cause scarring.

Most MUC1-related disease results from a specific type of variant that leads to production of an abnormal protein. This protein accumulates inside tubular cells and damages them. The common MUC1 variant can be difficult to detect with standard genetic sequencing.

REN provides instructions for making renin, a protein involved in blood pressure, fluid balance, and kidney function. Certain REN variants reduce normal renin production or cause abnormal protein to collect in kidney cells.

Changes in HNF1B can affect the development and function of the kidneys, pancreas, liver, and reproductive system. Some people have a variant within the gene, while others have a deletion that includes HNF1B and nearby genes.

The main risk factor is having a biological parent with the disease-causing variant. However, a person may be the first in a family to have a new genetic change. Family history can also appear negative when relatives were not tested, died before developing advanced disease, had mild disease, or received a different diagnosis.

Having a genetic variant does not reliably predict the exact age at which kidney failure will occur. Progression varies by gene, family, and individual.

Diagnosis

Evaluation usually begins with a medical history, family history, examination, and kidney tests.

A clinician may ask whether relatives have chronic kidney disease, gout at a young age, dialysis, or a kidney transplant. A pattern affecting several generations can suggest dominant inheritance.

Blood testing may include creatinine, which is used to estimate the glomerular filtration rate, or eGFR. The eGFR is an estimate of how well the kidneys filter blood. Clinicians may also check uric acid, potassium, bicarbonate, magnesium, blood sugar, and blood counts, depending on the suspected form.

Urine testing often shows little protein and few blood cells. This is sometimes called a "bland" urine result. However, urine findings alone cannot confirm or exclude ADTKD.

Kidney ultrasound may show kidneys that are normal in size or smaller than expected. Cysts can occur, but they are not required for diagnosis and are not specific to ADTKD.

Genetic testing can confirm many cases. Testing may use a kidney disease gene panel, targeted testing for a known family variant, or broader methods such as exome or genome sequencing. Some MUC1 variants require a specialized test and may be missed by routine sequencing. A negative result therefore does not always rule out ADTKD.

A genetics professional can explain what a positive, negative, or uncertain result means. A "variant of uncertain significance" is a genetic change whose role in disease is not yet known. It should not automatically be treated as a confirmed diagnosis.

Kidney biopsy is not usually able to identify the exact genetic form. It may show tubular shrinkage, scarring around the tubules, and broader kidney fibrosis, but these findings occur in many kidney diseases. Biopsy may still be considered when another condition is possible and the result would change care.

Testing relatives should be discussed with a nephrologist or genetics professional. The timing of testing in children requires special consideration because the medical benefits differ among genetic forms.

Treatment and management

There is currently no established treatment that removes the underlying genetic cause of most ADTKD. Care focuses on preserving kidney health, treating complications, and planning ahead if kidney function declines.

Kidney function, blood pressure, urine protein, and relevant blood values are monitored over time. Treatment decisions are based on the person's stage of kidney disease, symptoms, laboratory results, and other health conditions.

People with chronic kidney disease are generally advised to avoid preventable kidney injury. This may include reviewing all prescription medicines, nonprescription products, and supplements with a clinician. Nonsteroidal anti-inflammatory drugs like ibuprofen or naproxen , or NSAIDs, can harm kidney function in some people. Common examples include ibuprofen and naproxen. A clinician can suggest safer options when needed.

Dehydration may temporarily worsen kidney function, particularly during fever, vomiting, diarrhea, or poor fluid intake. A kidney care team can provide an illness plan, including guidance about fluids and whether any medicines should be paused. Fluid advice must be individualized because some people with advanced kidney or heart disease need limits.

Gout may be managed with medicines that lower uric acid or treat joint inflammation. These medicines require medical supervision because kidney function can affect drug choice and dose. Lowering uric acid can prevent gout attacks, but it has not been proven to stop ADTKD from progressing.

Other complications of chronic kidney disease may require treatment, including:

People whose kidneys can no longer support the body may need dialysis or a kidney transplant. Dialysis filters wastes and extra fluid from the blood. A transplant replaces kidney function with a donated kidney.

ADTKD does not usually return in a transplanted kidney because the donated organ does not carry the recipient's disease-causing variant. Potential biologically related living donors need careful kidney assessment and, when the family variant is known, appropriate genetic evaluation.

- Anemia, meaning too few healthy red blood cells
- High potassium
- Excess acid in the blood
- High blood pressure
- Bone and mineral problems
- Poor nutrition or fluid retention

Complications

The main long-term complication is progressive chronic kidney disease, which may eventually lead to kidney failure. The timing is highly variable and should not be predicted from family history alone.

Other possible complications include recurrent gout, anemia, abnormal potassium or acid levels, and complications common to advanced chronic kidney disease. Chronic kidney disease can also increase cardiovascular risk.

The emotional and family effects can be significant. A genetic result may raise questions about children, siblings, pregnancy planning, insurance, employment, or living donation. Genetic counseling can help people understand inheritance and available reproductive options without directing them toward a particular decision.

Follow up

Routine follow-up is usually coordinated by a nephrologist. Visit frequency depends on kidney function, the rate of change, blood pressure, laboratory abnormalities, and the genetic form. Follow-up may include blood and urine tests, medication review, assessment for gout or anemia, and discussion of family testing.

Contact the kidney care team promptly for persistent vomiting or diarrhea, reduced fluid intake, a clear decrease in urination, new swelling, repeated gout attacks, or symptoms that may represent a medicine side effect.

Seek urgent medical assessment for severe weakness, persistent inability to keep fluids down, rapidly worsening swelling, or new confusion.

Call emergency services for severe shortness of breath, chest pain, fainting, a seizure, or difficulty waking. These symptoms are not specific to ADTKD, but they can signal a serious complication that needs immediate care.

If kidney function is approaching kidney failure, early planning allows time to discuss transplant evaluation, living donation, dialysis choices, and supportive care. Planning does not mean dialysis is immediately required.

Sources

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