CONDITION

Renal cell carcinoma

Renal cell carcinoma is a cancer that begins in the kidney's urine-filtering tubules.

WHAT IT IS
Cancer arising from kidney tubule cells

BODY SYSTEM
Kidneys and urinary system

MAIN SYMPTOMS
Blood in urine, side pain, abdominal lump, weight loss

WHAT CAUSES IT
Acquired DNA changes, sometimes inherited

HOW IT IS DIAGNOSED
CT or MRI, with pathology from removed tissue or biopsy

MAIN TREATMENT
Surgery, surveillance, ablation, targeted therapy, or immunotherapy

CAN IT BE CURED?
Sometimes - localized tumours can often be removed

IS IT AN EMERGENCY?
Sometimes - heavy bleeding or breathing difficulty

LONG-TERM OUTLOOK
Often favorable when localized; poorer after distant spread

Overview

Renal cell carcinoma, or RCC, is a cancer that begins in cells lining tiny tubes within the kidney. These tubes help filter the blood and make urine. RCC is the most common type of kidney cancer in adults.

You have two kidneys, one on each side of your spine below the ribs. They remove waste and extra water from the blood, help control blood pressure, and support red blood cell and bone health.

There are several types of RCC. Clear cell RCC is the most common. Other types include papillary and chromophobe RCC. The type matters because different tumours may behave differently and respond to different treatments.

Some kidney growths are benign, meaning they are not cancer. Others are cancers that begin

elsewhere, such as the lining of the kidney's drainage system. Imaging and examination of tumour tissue help identify what kind of growth is present.

RCC often causes no symptoms when it is small. It may be found by chance during a scan for another concern. When detected before it has spread, surgery may be able to remove it completely. RCC that has spread can be harder to cure, but modern medicines can sometimes control it for long periods.

Symptoms

Early RCC may not cause any noticeable changes. Symptoms are more likely as a tumour grows, although the same symptoms can have many non-cancerous causes.

Possible symptoms include:

Blood in the urine may come and go. Even one episode should be assessed because urinary infections, kidney stones, prostate conditions, and other problems can also cause it.

RCC that has spread may cause symptoms in another part of the body. Examples include persistent bone pain, coughing, shortness of breath, or new neurological symptoms such as weakness.

- Blood in the urine, which may look pink, red, or brown
- Ongoing pain in the side, back, or upper abdomen
- A lump or swelling in the side or abdomen
- Unexplained weight loss or reduced appetite
- Persistent tiredness
- Fever or night sweats without a clear infection
- Anemia, meaning too few red blood cells

Causes and risk factors

RCC develops when kidney cells acquire changes in their DNA. DNA contains the instructions that control how cells grow. Certain changes can allow a cell to multiply when it should not, eventually forming a tumour.

In most people, the exact reason these changes occurred is not known. Having a risk factor does not mean that you will develop RCC, and some people develop it without any known risk factors.

Factors associated with a higher risk include:

Most RCC is not inherited. A smaller number of cases are linked to conditions such as von Hippel-Lindau syndrome, hereditary leiomyomatosis and RCC, or Birt-Hogg-Dubé syndrome. An inherited cause is more likely when kidney cancer develops at a young age, affects both kidneys, involves several tumours, or occurs in several close relatives.

- Smoking
- Higher body weight
- High blood pressure
- Long-term kidney failure, especially after years of dialysis
- Increasing age
- A close family history of kidney cancer
- Certain inherited genetic conditions

Diagnosis

An ultrasound may first identify a kidney mass. A contrast-enhanced CT scan is commonly used to study its size, location, blood supply, and possible spread. Contrast is a substance given into a vein to make structures easier to see. MRI may be used when CT contrast is unsuitable or when more detail is needed.

Your care team may also arrange:

A biopsy removes a small sample of tissue with a needle. It can help confirm whether a mass is cancer and identify its type. However, a biopsy is not required for every kidney mass. Imaging may provide enough information to proceed to surgery, with the final diagnosis made by examining the removed tissue.

If RCC is found, it is assigned a stage. The stage describes the tumour's size, whether nearby lymph nodes are involved, and whether cancer has reached distant organs. The tumour is also given a grade, which describes how abnormal its cells look under a microscope. Stage, grade, subtype, kidney function, and general health all help guide treatment.

- Urine testing for blood or infection
- Blood tests for kidney function, anemia, calcium, and liver function
- Chest imaging to look for spread to the lungs
- Other scans when symptoms or initial results suggest spread elsewhere

Treatment and management

Treatment is planned around the cancer's stage and location, whether both kidneys are working, and your overall health and priorities. A specialist team may include a urologist, cancer specialist, radiologist, pathologist, and specialist nurse.

Surgery is the main treatment for many localized tumours. A partial nephrectomy removes the tumour while keeping the rest of the kidney. A radical nephrectomy removes the whole kidney and nearby fatty tissue. The choice reflects the tumour's size and position and whether kidney-preserving surgery can be performed safely.

Some small kidney masses can be monitored with regular scans, called active surveillance. This may be considered when a mass appears to be growing slowly or when treatment risks may outweigh its immediate benefits. Surveillance is an active plan, not the same as ignoring the mass.

Ablation destroys a tumour without removing it. Methods include freezing it, called cryoablation, or heating it with radiofrequency or microwave energy. Ablation is generally used for selected small tumours.

RCC that cannot be removed or has spread may be treated with medicines that work throughout the body. These include:

These medicines may be used alone or in combinations. Traditional chemotherapy has a limited role in the common RCC subtypes, although it may be considered for some rare kidney cancers.

Radiotherapy uses focused radiation. It is not usually the main treatment for a localized kidney tumour, but it can treat selected tumours or help control symptoms from cancer in the bones, brain, or other sites.

After treatment, follow-up usually includes appointments, kidney function tests, and periodic scans. The schedule is based on the original tumour's stage and the treatment received.

- Immunotherapy, which helps the immune system recognize and attack cancer cells
- Targeted therapy, which blocks signals that cancer cells use to grow or form blood vessels

Complications

RCC can grow into nearby tissues or blood vessels. It may spread to lymph nodes, lungs, bones, liver, brain, or other organs. Possible effects include pain, fractures, breathing problems,

anemia, high calcium levels, or reduced kidney function.

Treatment can also cause complications. Kidney surgery may lead to bleeding, infection, blood clots, or reduced kidney function. Immunotherapy can sometimes cause the immune system to inflame healthy organs. Targeted therapies can affect blood pressure, skin, digestion, energy levels, or other body systems.

Side effects should be reported promptly. Many can be managed more effectively when recognized early.

Prevention

There is no guaranteed way to prevent RCC. Inherited genetic changes cannot be prevented, and many people who develop RCC have no clear avoidable cause.

Not smoking can reduce risk. Maintaining a weight that is healthy for you and managing high blood pressure may also help lower risk while supporting kidney and heart health. Follow workplace safety measures if your job involves potentially harmful chemicals.

Routine kidney cancer screening is not recommended for everyone. People with an inherited kidney cancer syndrome may be offered planned scans to find tumours early. This surveillance does not prevent RCC, but it may allow treatment before a tumour causes symptoms or spreads.

Living with it and what to expect

After treatment for localized RCC, many people return to their usual activities. Recovery from surgery can take weeks or longer. Tiredness, discomfort, and reduced stamina commonly improve gradually rather than all at once.

Most people can live with one healthy kidney. Follow-up may include checks of blood pressure, kidney function, and urine protein. Some people need advice about protecting their remaining kidney, particularly if they also have diabetes, high blood pressure, or existing kidney problems.

RCC can return after treatment, sometimes years later. The chance is influenced by the tumour's stage, grade, size, and subtype. Keeping follow-up appointments gives your team a chance to monitor for recurrence and support your kidney health.

Advanced RCC often needs ongoing or repeated treatment. A medicine may control the cancer for a time and then be changed if it stops working or causes difficult side effects. Some people continue daily activities during treatment, while others need adjustments to work,

exercise, or family responsibilities.

Uncertainty about scans and recurrence can be stressful. Specialist nurses, cancer support services, rehabilitation teams, and counselling can help with emotional and practical concerns.

When to get medical help

Arrange a prompt medical assessment if you notice blood in your urine, a persistent lump or pain in your side, unexplained weight loss, or ongoing symptoms that concern you. These symptoms often have causes other than RCC, but they should not be ignored.

If you already have RCC, contact your cancer team promptly about new or worsening symptoms, treatment side effects, reduced urine output, persistent vomiting, fever after a procedure, or pain that is becoming difficult to control. Do not wait for a routine follow-up appointment if symptoms are changing.

Seek emergency care for:

Routine follow-up is for planned examinations, blood tests, scans, and stable concerns. New severe symptoms or rapidly worsening treatment reactions need more urgent assessment.

- Heavy urinary bleeding, large blood clots, or inability to pass urine
- Fainting, severe weakness, or signs of major blood loss
- Sudden severe shortness of breath or chest pain
- New weakness on one side, difficulty speaking, a seizure, or sudden confusion
- A sudden severe headache, especially with vomiting or neurological changes

Common questions

Is renal cell carcinoma curable?

Sometimes. RCC that is confined to the kidney can often be removed completely with surgery or treated with ablation. Cure is less likely after distant spread, but medicines may shrink or control the cancer.

How fast does renal cell carcinoma grow?

Growth rates differ between tumours. Some small kidney masses grow slowly or remain stable for a time, while others behave more aggressively. Scans, tissue findings, and changes over time provide more useful information than size alone.

Does blood in my urine mean I have kidney cancer?

No. Urinary infections, kidney stones, prostate conditions, medicines, and other problems are more common causes. However, visible blood in the urine still needs prompt medical assessment, even if it happens only once.

Can I live normally with one kidney?

Many people live active lives with one healthy kidney. Blood pressure and kidney function still need monitoring. Your care team may recommend changes based on your remaining kidney's health rather than simply because one kidney was removed.

Can renal cell carcinoma come back after surgery?

Yes, recurrence is possible, although it does not happen to everyone. Risk is higher with larger, higher-stage, or higher-grade tumours. Follow-up scans are intended to detect a return or spread as early as practical.

Is renal cell carcinoma inherited?

Usually not. A small proportion is linked to inherited genetic conditions. Genetic assessment may be considered when RCC occurs young, affects both kidneys, involves multiple tumours, or appears in several close relatives.

Sources

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