All About Kidney Cancer

What are the kidneys?

The kidneys are two bean-shaped organs that are located in the back of the abdomen directly in front of where the lowest ribs can be felt on a person's back. The kidneys have many important functions essential for life including filtering the blood, removing waste products from the blood and ensuring that electrolytes in the blood are correctly balanced. These waste products then become urine. In addition, the kidneys produce two important hormones: erythropoietin, which is responsible for the production of oxygen carrying red blood cells and rennin, which helps control blood pressure.

Each of the kidneys can be divided into two main functional parts - the cortex and renal pelvis. The outer region of the kidney is called the cortex. The cortex consists of a series of tubes (called collecting tubules) and is responsible for the filtration of blood. The inner region of the kidney is called the renal pelvis. The renal pelvis contains medullary pyramids that collect the filtrate (urine) from collecting tubules in the cortex and send it through the ureters to the urinary bladder. Different types of cancers develop in the two different regions of the kidneys.

What is kidney cancer?

A tumor is a mass of abnormally growing cells. Tumors can be either benign or malignant. Benign tumors have uncontrolled cell growth, but without any invasion into normal tissues and without any ability to spread to distant parts of the body. A tumor is called malignant, or cancer, if tumor cells are able to invade tissues and spread locally, as well as to distant parts of the body. Therefore, kidney cancer occurs when cells in either the cortex of the kidney, or cells in the renal pelvis, grow uncontrollably and form tumors that can invade normal tissues and spread to other parts of the body.

Renal cell carcinoma is the most common type of kidney cancer. It accounts for about 9 out of 10 cases of kidney cancer. In renal cell carcinoma, malignant tumors can be growing in either one or both kidneys and there may be multiple tumors. There are several types of renal cell carcinoma. The type is determined by the appearance of the cancer cell under a microscope. Types of renal cell cancer include:

- Clear Cell renal cell carcinoma - Accounts for about 7 out of 10 cases of renal cell cancer. Cells appear pale or clear.
- Papillary renal cell carcinoma - Accounts for about 1 out of 10 renal cell carcinomas. This type of cancer cell forms finger-like projections and when they absorb certain dyes they appear pink.
- Chromophobe renal cell carcinoma - Accounts for about 5 % (5 out of 100) of all cases of renal cell carcinoma. They appear pale or clear but the cells are much larger than clear cell carcinoma.
- Rare Types - These subtypes are rare and make up less than 1% of all occurrences of renal cell carcinoma. They include: collecting duct, multilocular cystic, medullary carcinoma, mucinous tubular and spindle cell carcinoma and neuroblastoma-associated renal cell carcinoma.
- Unclassified - Very rare. They are determined to be unclassified when more than one type of cell exists or the cell does not fit into a specific category.

Transitional cell carcinomas, also known as urothelial carcinomas, account for about 5 to 10 out of every 100 diagnoses of kidney cancer. Transitional cell carcinoma is cancer in the lining of the renal pelvis where urine is stored before it enters the ureter to then travel to the bladder. This type of kidney cancer looks similar to bladder cancer cells when viewed under a microscope.

**Wilms Tumors** is a tumor commonly found in children and that is very rare in adults. It can affect either one or both kidneys and prior to being diagnosed the tumors are usually quite large.
Renal Sarcoma is a rare type of kidney cancer that begins in the blood vessels or connective tissue of the kidney and accounts for less than 1% of kidney cancers.

Benign kidney tumors are non-cancerous, but can grow very large and have an effect on the body. These include renal adenoma, oncocytoma and angiomyolipoma. They are treated using surgery, radiofrequency ablation and/or arterial embolization.

**What causes kidney cancer and am I at risk?**

The American Cancer Society estimates 73,820 individuals will be diagnosed every year with kidney cancer (all types). Kidney cancer tends to occur more frequently in older people with the average age at diagnosis being 64. It is very rare in individuals under the age of 45. Kidney cancer is more common in men than women. African Americans and American Indians/Alaska Natives have slightly higher rates of renal cell carcinomas than Caucasians.

A risk factor is anything that influences your possibility of developing a disease. Kidney cancer risk factors include:

- **Smoking** – Smoking increases your risk of developing kidney cancer. Risk for kidney cancer is associated with how much you smoke (i.e. the more you smoke, the greater the risk). Risk decreases when you stop smoking.
- **Obesity** - Obesity changes different hormone levels, which can lead to kidney cancer.
- **Workplace exposure** - Exposure to cadmium, some herbicides and some organic solvents may increase risk of kidney cancer.
- **Family history** - The risk for kidney cancer increases in persons with a first-degree (parent/sibling) relative who has had kidney cancer.
- **High blood pressure** – the increased risk may be associated with medications to treat blood pressure (diuretics) or by the actual condition itself.
- **Chronic/advanced kidney disease** – individuals on dialysis or with advanced kidney disease may be at a higher risk for developing kidney cancer.
- **Genetic/hereditary conditions** – these include von Hippel-Lindau disease, hereditary papillary renal cell carcinoma, hereditary leiomyoma-renal cell carcinoma, Birt-Hogg-Dube (BHD) syndrome, familial renal cancer, Cowden syndrome, Tuberous sclerosis and hereditary renal oncocytoma. These conditions are inherited from your parents. Talk with your healthcare provider about your family history and potential referral for genetic testing and counseling.

**How can I prevent kidney cancer?**

Given the strong connection between cigarette smoking and kidney cancer, the best way to decrease your risk is to quit smoking or never start. Try to maintain a healthy weight and avoid toxins known to lead to cancer.

**What screening tests are available?**

There are no screening tests for kidney cancer. However, the use of CT scans and ultrasounds have enhanced the early detection of kidney cancer once signs or symptoms have developed (see below). With the advent of CT scans and ultrasounds, 25-40% of kidney cancers are now detected incidentally during work up for a different problem. These tumors are more likely to be smaller (hence causing no symptoms) and be more favorable to treatment.

Other tests that may be used in detecting a kidney tumor include:

- **Intravenous pyelogram (IVP):** used to assess kidney function. IVPs are done by injecting dye into a patient's arm and then taking x-rays of the abdomen to see that dye subsequently excreted by the kidneys as urine.
- **Cytology:** simply looking at urine under a microscope and looking for cancerous cells within the urine.

**What are signs of kidney cancer?**

The most common sign of kidney cancer is blood in the urine. Blood in the urine may be seen by the naked eye (called gross hematuria), or found only when the urine is analyzed in a laboratory (called microscopic hematuria).
Other common symptoms of kidney cancer include:

- Pain in the low back, usually on one side.
- A mass you or your healthcare provider can feel on your side or lower back.
- Feeling tired.
- Decreased appetite.
- Weight loss (without trying).
- Fever.
- Anemia (low red blood cell counts).

Symptoms caused by metastatic disease (cancer that has spread to other organs) include fever, weight loss, and night sweats (drenching sweats that require changing of clothes or bedsheets). Other symptoms include hypertension, increased calcium in the blood, and liver problems.

**How is kidney cancer diagnosed?**

If kidney cancer is suspected, your healthcare provider will complete a physical exam as well as take your medical history. They may order blood and urine tests, including a urine cytology test. You may also have imaging studies including CT scans (used to evaluate the tumor size and spread) and/or MRI scans (used to ensure the tumor has not involved any of the large blood vessels that are in the vicinity of the kidney). In addition, a chest x-ray and bone scan may be done. These tests are used to evaluate if the cancer has spread to the lungs or other organs.

To confirm a diagnosis of any cancer, tissue or cells must be examined by a pathologist. To do this, a biopsy may need to be done. During a biopsy, a needle is inserted into the suspected tumor. In some cases, the CT scan and/or MRI is so convincing that cancer is present, that the biopsy is done as part of a surgical procedure to remove the kidney.

**How is kidney cancer staged?**

With these tests, a stage is determined to help decide the treatment plan. The stage of cancer, or extent of disease, is based on information gathered through the various tests done as the diagnosis and work-up of the cancer is being performed.

Kidney cancer is most commonly staged using the “TNM system.” The TNM system is used to describe many types of cancers. It has three components: T-describing the extent of the "primary" tumor (the tumor itself); N-describing if there is cancer in the lymph nodes; M-describing the spread to other organs (metastases). The staging system is very complex. The entire staging system is outlined at the end of this article. Though complicated, the staging system helps healthcare providers determine the extent of the cancer, and in turn, make treatment decisions for a patient's cancer.

In addition to the “TNM system,” kidney cancers are assigned a prognostic risk group (low risk, intermediate risk and poor-risk). This grouping is based on certain factors that may indicate your ability to tolerate treatments. These include time since diagnosis, performance status, certain lab values and the absence or presence of metastasis. These categories can impact treatment options.

**How is kidney cancer treated?**

There are several treatment options available for kidney cancer. Treatment decisions are patient specific and depend on subtype of disease, staging and prognostic risk group.

**Surgery**

Surgery is the primary choice of treatment for kidney cancer. There are two types of surgical approaches associated with treatment of kidney cancer. A radical nephrectomy is the removal of the entire kidney, the adrenal gland (which sits atop the kidney) and the fatty tissue around the kidney. The removal of the kidney may be done through a large incision on the abdomen or back or may be done through a laparoscopic technique in which several small incisions are made rather than one large incision.
A second surgical treatment option is a nephron-sparing nephrectomy, also known as a partial nephrectomy. In this procedure, only the part of the kidney affected by cancer is removed. It is the preferred treatment for early stage kidney cancer. The benefit of a partial nephrectomy is to maintain as much kidney function as possible. A partial nephrectomy can be done through an open incision or through a laparoscopic procedure, the same as a radical nephrectomy. Each has associated benefits and risks, but the goal of these surgeries is good long-term renal function and cancer-free survival.

During both a radical and partial nephrectomy, the surgeon may choose to perform a regional lymphadenectomy. In this procedure, lymph nodes in the same region of the kidney are removed and checked for cancer cells. An adrenalectomy, removal of the adrenal gland, is always done in a radical nephrectomy and may be performed during partial nephrectomy.

**Radiation Therapy**

Radiation is the use of high-energy x-rays to kill the tumor. Radiation can be given two different ways: external beam (from a machine outside the body) or brachytherapy (also called internal radiation, from an internally implanted radioactive source). Kidney cancer is not very sensitive to radiation but can be the treatment of choice for a patient who is not healthy enough to undergo surgery. Radiation can also be used to ease symptoms and side effects of kidney cancer including pain and bleeding.

**Chemotherapy**

Chemotherapies are medications, given either orally or intravenously, that are used to kill tumor cells. Kidney cancer cells are often resistant to standard chemotherapy, so it is not considered a standard treatment for kidney cancer. Chemotherapy is primarily used in advanced stage or relapsed kidney cancers.

There are several targeted therapies used in the treatment of kidney cancer. These therapies are used to treat cancer that “targets” a protein or receptor found on the cancer cell and interfere with the cell’s activity or growth. Each targeted therapy “targets” a different receptor or cellular function. Some of these medications include: sorafenib, sunitinib, temsirolimus, everolimus, bevacizumab, pazopanib, ipilimumab, nivolumab, cabozantinib, axitinib, lenvatinib, and erlotinib. These medications may be used alone or in combination. Many of these medications are also being studied for use in early stage, clear cell RCC.

In select patients, interferon-a or interleukin-2 may be used. These are immunotherapies that enable the body’s immune system to fight and destroy tumor cells. These treatments can have significant side effects. With the development of so many new targeted therapies that are helpful in the treatment of recurrent/advanced stage kidney cancer, these treatments are not used as frequently as they once were.

**Clinical Trials**

There are clinical research trials for most types of cancer, and every stage of the disease. Clinical trials are designed to determine the value of specific treatments. Trials are often designed to treat a certain stage of cancer, either as the first form of treatment offered, or as an option for treatment after other treatments have failed to work. They can be used to evaluate medications or treatments to prevent cancer, detect it earlier, or help manage side effects. Clinical trials are extremely important in furthering our knowledge of disease. It is through clinical trials that we know what we do today, and many exciting new therapies are currently being tested. Talk to your provider about participating in clinical trials in your area. You can also explore currently open clinical trials using the OncoLink Clinical Trials Matching Service.

**Follow-up Care and Survivorship**

Your follow-up care will be determined by your care team and will vary depending upon the type of treatment you received for your kidney cancer. If surgery was part of your treatment plan, it is recommended that you visit your healthcare provider, including a physical exam and blood work, every three to six months for the first three years after treatment and then yearly. Imaging tests (CT/MRI/Ultrasound) may be ordered every three to six months for the first three years after treatment and then every year until 5 years after treatment.

Fear of recurrence, relationships and sexual health, financial impact of cancer treatment, employment issues, and coping strategies are common emotional and practical issues experienced by kidney cancer survivors. Your healthcare team can identify resources for support and management of these challenges faced during and after cancer.
Cancer survivorship is a relatively new focus of oncology care. With some 15 million cancer survivors in the US alone, there is a need to help patients transition from active treatment to survivorship. What happens next, how do you get back to normal, what should you know and do to live healthy going forward? A survivorship care plan can be a first step in educating yourself about navigating life after cancer and helping you communicate knowledgeably with your healthcare providers. Create a survivorship care plan today on OncoLink.

Resources for More information

Kidney Cancer Association

Educates families and providers, and serves as an advocate on behalf of patients at the state and federal levels in the United States and globally. Provides information about kidney cancer and research.

http://www.kidneycancer.org/


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<thead>
<tr>
<th>Primary Tumor (T)</th>
<th>Description</th>
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<tbody>
<tr>
<td>TX</td>
<td>Primary tumor cannot be assessed</td>
</tr>
<tr>
<td>T0</td>
<td>No evidence of primary tumor</td>
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<tr>
<td>T1</td>
<td>Tumor ≤7 cm in greatest dimension, limited to the kidney</td>
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<tr>
<td>T1a</td>
<td>Tumor ≤4 cm</td>
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<tr>
<td>T1b</td>
<td>Tumor ≥4 cm but ≤7 cm in greatest dimension, limited to the kidney</td>
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<tr>
<td>T2</td>
<td>Tumor &gt;7 cm in greatest dimension, limited to the kidney</td>
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<tr>
<td>T2a</td>
<td>Tumor &gt;7 cm but ≤10 cm in greatest dimension, limited to the kidney</td>
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<tr>
<td>T2b</td>
<td>Tumor &gt;10 cm, limited kidney</td>
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<tr>
<td>T3</td>
<td>Tumor extends into major veins or perinephric tissues, but not into the ipsilateral adrenal gland and not beyond Gerota’s fascia</td>
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<tr>
<td>T3a</td>
<td>Tumor extends into the renal vein or its segmental branches, or invades the pelvicalyceal system, or invades perirenal and/or renal sinus fat but not beyond Gerota’s fascia</td>
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<tr>
<td>T3b</td>
<td>Tumor extends into the vena cava below the diaphragm</td>
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<tr>
<td>T3c</td>
<td>Tumor extends into the vena cava above the diaphragm or invades the wall of the vena cava</td>
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<tr>
<td>T4</td>
<td>Tumor invades beyond Gerota’s fascia (including contiguous extension into the ipsilateral adrenal gland)</td>
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<tr>
<th>Regional Lymph Nodes (N)</th>
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<td>Regional lymph nodes cannot be assessed</td>
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<td>N1</td>
<td>Metastasis in regional lymph node(s)</td>
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<td>Stage I</td>
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