RENAL CELL CARCINOMA (RCC)

Renal cell carcinoma (RCC) is the most common type of kidney cancer accounting for around 90 percent of all kidney cancers. Early stage renal cancers tend to have a better prognosis, while advanced cancers have a worse prognosis. At diagnosis, 30 percent of kidney cancer patients show signs of advanced disease and 15-25 percent of patients have metastatic disease, where the cancer has spread to other parts of the body.

FACTS AND FIGURES

- Approximately 338,000 new cases of kidney cancer are diagnosed worldwide each year, representing approximately 3 percent of all cancers.
- In the United States, more than 60,000 new cases of RCC are diagnosed each year and approximately 14,000 patients are expected to die from the disease.
- Patients with advanced RCC have five-year survival rates of approximately 12 percent.
- Between 40 and 65 percent of patients who progress following first-line therapy go on to receive a second-line treatment.

RISK FACTORS

Not enough is known about kidney cancer to determine exactly how to prevent it; however, these are some of the most common risk factors:

- Smoking: Cigarette smoking doubles the risk of developing kidney cancer.
- Obesity: Research has often shown a link between kidney cancer and obesity.
- Gender: Men are two to three times more likely to develop kidney cancer than women.
- Family History and Genetics: People with a strong family history of kidney cancer may have a higher chance of developing it. Certain genetic conditions, including von Hippel-Lindau disease, may also increase the risk of developing RCC.

BIOLOGY OF RCC

Several factors and pathways are involved in the development and progression of RCC:

- Vascular endothelial growth factor (VEGF) and platelet-derived growth factor (PDGF) are two proteins found at high levels in patients with RCC. Overproduction of these proteins in RCC patients is often caused by a genetic mutation, the most common of which is the inactivation of the von Hippel-Lindau gene.
- VEGF and PDGF are important to the growth and survival of tumors:
  - High VEGF levels lead to a process called angiogenesis – the formation of new blood vessels that feed the tumor.
  - High PDGF levels lead to the maturation and survival of newly formed and existing blood vessels and supporting tissue.
  - PDGF can therefore contribute to cancer progression.
- The mammalian target of rapamycin (mTOR) pathway has also been shown to play a central role in the regulation of cell growth. Increasing evidence links its dysregulation (impaired functioning) to cancer.
- The mTOR pathway contributes to many critical cellular functions, including angiogenesis, and recent studies have shown that the mTOR pathway is more significantly altered in clear-cell RCC patients.

DIAGNOSIS AND TREATMENT

- Symptoms and signs of RCC may include blood in the urine, a lump in the side or back, pain in the side or back, fatigue, weight loss or fever that is not caused by an infection.
- Common treatment options for people with kidney cancer are surgery, targeted therapy and biological therapy (immunotherapy). Patients may receive more than one type of treatment. However, many kidney cancers are found at a late stage when they are more difficult to treat because they can grow large without causing any pain and/or because small tumors cannot be seen or felt during a physical exam.
- Until 2006, there were limited treatment options available. Immunotherapies, such as interleukin-2 and interferon alfa, were widely used as first-line treatment of metastatic disease. These treatments work by boosting the body’s own immune defenses and stimulating the growth of white blood cells that help fight the disease. Other types of immunotherapies include checkpoint inhibitors and immune modulators, cancer vaccines, adoptive cell therapy, monoclonal antibodies, cytokines, and adjuvant immunotherapies.
- Since 2006, almost 10 treatments have been approved and more are in development.