

## KIDNEY CANCER: EPIDEMIOLOGY AND TREATMENT

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**Abstract:** After more than two decades of rising rates, in recent years the total kidney cancer incidence worldwide has shown signs of stabilizing, or even decreasing. In adults, kidney cancer consists of renal cell carcinoma (RCC), the predominant form, and renal transitional cell carcinoma (RTCC); these types primarily arise in the renal parenchyma and renal pelvis. The number of new cases of renal cell carcinoma has been steadily increasing since the 1960s, reaching 65,000 and 92,000 annually in the United States and Europe, respectively, in 2017. The current standard of care for early-stage disease is nephron-sparing surgery, which has a demonstrated long-term disease-free survival and an acceptable safety profile. Technical developments (thin, powerful probes and real-time image guidance systems) have allowed image-guided percutaneous ablation to become a viable option for stage I renal cell carcinoma. All 3 ablative modalities (radiofrequency ablation, microwave ablation, and cryoablation) have been extensively applied. The utilization of ablation was initially hampered by the lack of prospective, long-term oncologic data. As a result, ablation was reserved for specific subgroups of patients, for example, patients with solitary kidney, chronic kidney disease; poor surgical candidates; or patients with syndromes that predispose them to renal cell cancer. Recently, however, studies on percutaneous ablation for early-stage renal cancer have yielded prospective, long-term oncologic data, affirming the earlier, lower-level-evidence studies. In conclusion, image-guided percutaneous ablation should be considered a viable, curative option for stage IA renal cell carcinoma.

**Key Words:** Succinate dehydrogenase kidney cancer, cryoablation, ablation, nephrectomy, nephron-sparing surgery, renal cell carcinoma.

**Epidemiology:** Men have a two to three times higher risk of the cancer than women. The median age at diagnosis is 67, but children are occasionally diagnosed with the disorder. The table shows that no single risk factor is dominant, and that several environmental or genetic factors could be synergistically carcinogenic (eg, smoking, hypertension). Unusual associations between kidney cancer and other disorders have been reported, for example interleukin-6 production from various lymphoproliferative disorders plus kidney cancer.

Renal cell carcinoma represents 4.0% of all new cancers and is the cause of 2.8% of all cancer deaths in the United States. Survival is heavily dependent on TNM (primary tumor [T], regional nodal involvement [N], distal metastasis [M]) stage at diagnosis and has followed a favorable trend over the last few decades.

## Clinical presentation

Flank and back pain, fatigue, anaemia, haematuria, and weight loss are the most common presenting symptoms of kidney cancer. However, increasing numbers of apparently asymptomatic kidney cancers are diagnosed incidentally at radiography for other disorders. Cancers detected in this way have a good prognosis, but ultrasonographic screening of several large groups of people in Japan yielded low rates of incidental cancer diagnosis. Thus, routine ultrasonographic screening cannot be recommended except for VHL patients, for haemodialysis patients with intact kidneys, for high-risk families, and perhaps for patients with previous irradiation of the kidney. With an absence of local signs or symptoms, kidney cancer presents with metastatic disease in 25–36% of patients. Those patients with localised disease have differing prognoses based upon the tumour and node status, tumour size, cytogenetics, and histology.

## Pathology

Pathological stage is better than clinical stage at predicting outcome. Careful pathological analysis will detect unusual renal neoplasms such as transitional-cell carcinoma, tumours of the duct of Bellini (collecting duct), oncocytoma, sarcoma, lymphoma, and adult Wilms' tumour, for which prognosis and management is distinct.

## Succinate dehydrogenase kidney cancer

Succinate dehydrogenase kidney cancer (SDH-RCC) is another inherited form of kidney cancer characterized by germ line mutation of a Krebs cycle enzyme. Patients affected with SDH-RCC are at risk for the development of pheochromocytomas, paragangliomas, and kidney cancer. Patients affected with SDH-RCC have germ line mutation of succinate dehydrogenase B or succinate dehydrogenase D, and like FH-deficient kidney cancer, these tumors are characterized by aerobic glycolysis.

## TREATMENT

Surgical resection remains an effective therapy for clinically localized RCC, with options including radical nephrectomy and nephron-sparing surgery. Each of these modalities is associated with its own benefits and risks, the balance of which should optimize long-term renal function and expected cancer-free survival.

A radical nephrectomy includes a perifascial resection of the kidney, perirenal fat, regional lymph nodes, and ipsilateral adrenal gland. Radical nephrectomy is the preferred treatment if the tumor extends into the inferior vena cava. Approximately one-half of patients with these tumors experience long-term survival.

Ablation has been used as an adjunctive tool during open surgical approaches for RCC for many years. Boosted by advances in image guidance systems (computed tomography [CT], ultrasound, and magnetic resonance imaging [MRI]) and the development of thin powerful ablation probes, image-guided percutaneous ablation became practical in the early 2001s. Another important factor in the evolution of percutaneous ablation for RCC has been the ever-increasing use of cross-sectional imaging. The most commonly utilized ablative modalities are radiofrequency ablation (RFA), microwave ablation (MWA), and cryoablation. Although they are based on different physical principles and use different technologies, the aim of the operator is identical: to effectively ablate the entire target lesion plus a safety margin around it. Limitations in technology translate into limitations in the size of the ablation zone. Although overlapping ablations and/or the use of more probes can expand the ablation zone, ablation efficacy declines with increasing lesion size.

The safety profile of percutaneous ablation for RCC is a significant advantage over open or laparoscopic surgical approaches. The overall rate of clinically significant complications for percutaneous ablation is reported between 4% and 11%. Image-guided percutaneous renal cancer ablation can be performed, in

most patients, on an outpatient basis. Hemorrhage requiring intervention (transfusion, admission, or embolization) occurs in 3% to 6% of patients.

## CONCLUSIONS

Kidney cancer consists of renal cell carcinoma (RCC), the predominant form, and renal transitional cell carcinoma (RTCC); these types primarily arise in the renal parenchyma and renal pelvis. The number of new cases of renal cell carcinoma has been steadily increasing, and reaching 65,000 and 92,000 annually in the United States and Europe. The current standard of care for early-stage disease is nephron-sparing surgery, which has a demonstrated long-term disease-free survival and an acceptable safety profile.

In conclusion, image-guided percutaneous ablation RCC yields long-term oncologic outcomes that approach of surgery. Where possible it should be the primary treatment option for select patients (poor surgical candidates or those with solitary kidney, multifocal disease) and a viable option for the rest.

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