Nephron-sparing surgery (NSS) is now an established approach for patients with localized RCC when there is a clinically relevant need to preserve renal function. Elective NSS is also indicated in patients with a single, small, unilateral, localized RCC when the opposite kidney is completely normal. The technical success rate with NSS for RCC is excellent, and long-term patient survival free of cancer is comparable to that obtained after radical nephrectomy.

We recently reviewed the results of open partial nephrectomy in 107 patients with localized sporadic RCC treated at the Cleveland Clinic prior to 1988 who were followed for a minimum of 10 years. Long-term preservation of renal function was achieved in 93% of patients, and the 10-year cancer-specific survival rate for the entire series was 73%. For patients with tumors 4 cm or less, the 10-year cancer-specific survival rate was 91%.

In another recent study from the Cleveland Clinic, we reviewed the long-term results of open partial nephrectomy in 400 patients with RCC involving a solitary kidney. Postoperatively, 97% of patients maintained satisfactory renal function without the need for dialysis. Cancer-specific survival was 89% at 5 years and 82% at 10 years.

While open surgical partial nephrectomy remains the gold standard for nephron-sparing treatment of RCC, laparoscopic partial nephrectomy is now available in selected cases. The optimal indications for laparoscopic NSS are in patients with a relatively small and peripheral renal tumor. In such cases, laparoscopic NSS is proving to be an effective minimally invasive therapeutic approach with respect to renal functional outcome, with additional advantages of reduced postoperative narcotic usage, earlier hospital discharge, and a faster convalescence. The laparoscopic approach is associated with longer warm renal ischemia time, more major intraoperative complications, and more postoperative urologic complications. Continued efforts are required to develop laparoscopic renal hypothermia techniques and to facilitate intrarenal suturing while minimizing the warm ischemia time.

More recently, energy sources for tumor ablation are being applied to selected patients with a small, peripheral RCC. The available modalities include cryoablation, radiofrequency ablation, high intensity focused ultrasound, and local radio-surgery (cyberknife). These modalities are currently being applied laparoscopically and percutaneously. They may ultimately permit tumor destruction by completely extracorporeal methods. A limiting factor with several of these approaches is the ability to image the destruction process precisely as it is being administered, thereby minimizing injury to normal adjacent parenchyma while assuring complete destruction of the tumor. In order to be considered effective/established nephron-sparing approaches for RCC, these modalities must demonstrate clinical and pathological success that approach those reported in open partial nephrectomy. The initial use of these technologies must be limited to well-selected, informed and motivated patients.