



Management of localized Kidney Cancer

Written by Mr Arun Z. Thomas
MCh FRCS (Urol), Consultant
Urologist and Robotic Surgeon,
Tallaght University Hospital and
Beacon Hospital

Introduction

Renal cell carcinoma (RCC) is the third most frequent urologic cancer and represents 2-3% of all adult malignancies. In Ireland about 600 people are diagnosed with kidney cancer each year. It is more common in men than women and incidence increases with age (mean age of renal cell cancer diagnosis is 65yrs). It is rare for people under 40 years to get kidney cancer, but can occur especially in the context of hereditary/genetic conditions which account for approximately 5% of all cases. Renal cell carcinoma is the most common type of kidney cancer in adults and accounts for approximately 85% of malignancies arising from the kidney.

Only 10% of patients present clinically with the classic triad of haematuria, flank pain and the presence of a palpable flank mass. As modern imaging has changed our medical practice, greater than 60% of renal tumours are now diagnosed while investigating other conditions. These tumours



are often small and of lower stage. This increase in 'incidentalomas' also highlights a significant increase in the surgical treatment of small tumours over the last 2 decades. Risk factors for RCC include smoking, obesity and hypertension, positive family history and patients on dialysis.

Staging of RCC is based on the TMN staging system summarized in Table 1

Surgical excision is still the 'gold standard' for localized renal tumours, however numerous options are available for patients and surgeon to decide on the best treatment option.

Radical Nephrectomy

Surgical resection of localised RCC is the benchmark for potential long-term cure. Laparoscopic and or open radical nephrectomy (RN)

is considered the gold standard for stage T1b-T4 tumours, whereas nephron-sparing surgery/partial nephrectomy (PN) is the preferred operative modality for small renal masses.

Laparoscopic radical nephrectomy is well established and has become the surgical standard of care procedure for larger localised kidney tumours. Long-term oncologic outcomes in numerous prospective cohorts that have compared laparoscopic versus open radical nephrectomy show equivalent oncologic control with long term follow up. The benefits of minimally invasive surgery include small incision, less surgical postoperative pain, shorter hospital stay and faster post-operative recovery. Hence laparoscopic radical nephrectomy has become the gold standard of practice for the treatment of T1, T2 and some T3aN0 tumours. Nevertheless, open radical nephrectomy still remains a valuable and indispensable approach for more complex and locally advanced kidney cancers.

Table 1:

TMN staging for localized Renal Cell Carcinoma	
T1	Tumour <7cm in greatest dimension, limited to the kidney <ul style="list-style-type: none"> T1a ≤4cm in greatest dimension T1b >4cm ≤7cm in greatest dimension
T2	Tumour >7cm in greatest dimension, limited to the kidney <ul style="list-style-type: none"> T2a >7cm ≤10cm in greatest dimension T2b >10cm in greatest dimension
T3	Tumour extend into major veins or perinephric tissues limited to Gerota's fascia
T4	Tumor invades beyond Gerota's fascia/extension to surrounding structures/ ipsilateral adrenal gland
N1	Metastasis in regional lymph nodes
M1	Distant metastasis



DaVinci Robot at Tallaght University Hospital

Management of Small Renal Masses (SRM)

Small renal masses under 4cm tend to have slow 2-3mm/year growth rates and up to 20% of such lesions are benign. The metastatic potential of such small renal tumours under 4cm is also very low ($\leq 1\%$).

Today nephron sparing surgery or partial nephrectomy has become the surgical standard of care for small renal tumours (T1a and probably some T1b). This

is based on numerous studies which favourably compare the oncological and functional outcomes of partial versus radical nephrectomy.

Surgical principles of PN include preservation of normal renal parenchyma while maintaining a clear oncological margin and minimization of prolonged warm ischaemia. Warm ischaemia occurs when the renal vessels are clamped during excision of the tumour to reduce bleeding. Prolonged ischaemia time (i.e.

greater than 20 to 30 minutes) can affect long-term renal function). Partial nephrectomy can be a more technically challenging than radical nephrectomy with potential higher perioperative complications (i.e. bleeding, urine leak), but has the advantage of preserving nephrons and renal function.

Alternative options in the management of SRM's also include Active Surveillance, radiofrequency ablation, cryotherapy summarised in Table 2:

Table 2:

Management of Small Renal Masses (SRM)	
Partial Nephrectomy: <ul style="list-style-type: none"> • Open • Laparoscopic or Robotic assisted 	Surgical excision of SRM with preservation of normal renal parenchyma. Standard of care for the management for most SRM's. (Equivocal oncological and more favorable functional outcomes compared to radical nephrectomy)
Active Surveillance	Close observation with radiological monitoring of SRM's: tends to be restricted to more elderly patients, patients with significant co-morbidities or those that refuse surgery.
Radiofrequency Ablation	Hyperthermic ablation therapy by radio frequency elevates the temperature of the tissues above 100°C created by an electrical current. Performed by introduction of a probe, causing coagulation necrosis.
Cryotherapy	Hypothermic ablation therapy (-40° C) is performed through the introduction of a probe, whose function is to destroy the tissue by cellular damage from freezing, apoptosis, coagulation necrosis using argon gas.

Robotic Surgery for Kidney Cancer.

Surgical management of renal cell carcinoma has undergone a transformation in recent decades, especially with the use robotic platforms such as the Da Vinci system by Intuitive Surgical. Increasingly, larger and more complex renal lesions are now being treated in a minimally invasive fashion.

Robotic assisted partial nephrectomy allows enhanced dexterity and three-dimensional vision afforded by the robotic platform. Robotics allows the surgeon to excise and reconstruct the kidney with more precision and ease compared to more conventional laparoscopic techniques. Robotic assisted partial nephrectomy overcomes the limited degree of freedom of nonarticulating laparoscopic instruments that often makes tumour excision and reconstruction under the time constraints of warm ischaemia demanding. Such advantages account for the rapidly increasing number of PNs being performed robotically versus more standard approaches such as laparoscopic and open techniques. Robotic platforms/ technology such as DaVinci are very expensive which until recently limited its introduction into surgical practice in Ireland. However, robotic surgery is now available in multiple public hospitals across Ireland such as Tallaght University Hospital as well as private hospitals. The development of new competing robotics systems in the near future will likely drive costs down. Regardless, surgeon expertise, patient selection and tumour factors and are still paramount in determining the best outcomes for the patient rather than the technique or technology used.

In summary, surgical extirpation continues to be gold standard in treating localized kidney cancer. The management of small renal masses, partial nephrectomy is the standard of care in most patients, but active surveillance and renal ablative techniques are also acceptable treatment options in elderly patients or patients with significant co-morbidities.

References:

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