

Nephron-Sparing Surgery

by Dr Gerald Tan

What you need to know about this new treatment option for early kidney cancer

CANCER OF THE kidney refers to the uncontrolled growth of abnormal cells within the kidneys, which serve important role in removing waste products from the body. Early Stage 1 renal cell cancers, defined as less than 7cm in size, are usually diagnosed incidentally when patients undergo routine ultrasound or computed tomography (CT) scans for health screening or other unrelated symptoms. In its early stages, kidney cancer usually does not cause any symptoms. As it progresses, it may cause visible blood in the urine, back pain, and weight loss. While some renal cell cancers are detected only after they have grown quite big, two-thirds of all kidney cancers are usually diagnosed before it spreads (metastasise) to the other organs such as the lung and the bony skeleton, through the bloodstream or the lymph vessels (Figure 1).

The diagnosis of cancerous change is made based on the presence of features on the CT or magnetic resonance imaging (MRI) scan of the kidneys. When these tumours are surgically removed, 20% of such tumours will turn out to be benign and do not need further follow-up.¹

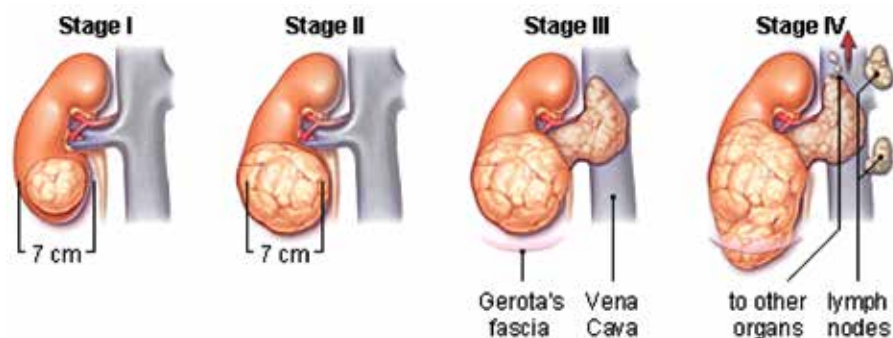
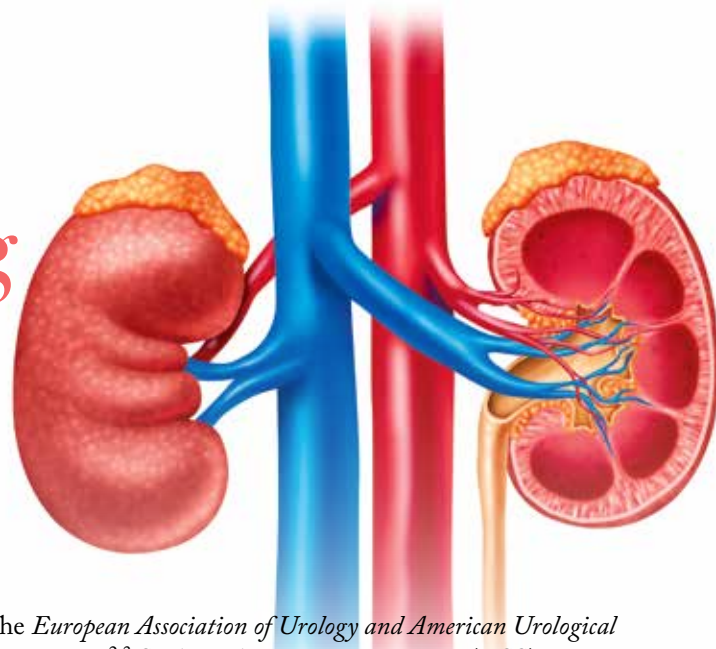


Figure 1: Stages of kidney cancer progression

What is the best treatment for early stage kidney cancers?

Surgical removal of Stage 1 kidney tumours, whilst sparing the rest of the unaffected kidney, has now been established as the current international standard of care advocated by



the *European Association of Urology and American Urological Association*.^{2,3} Such nephron-sparing surgery (NSS) is now preferred to radical nephrectomy, where the entire kidney is removed. Several large-scale studies have found that patients who undergo nephron-sparing surgery live longer and have a significantly lower risk of developing hypertension, ischaemic heart disease or strokes over the long term, compared to patients who had their entire kidney removed.³ In patients who have only one functioning kidney which undergoes cancerous change, NSS is the only means that offers such patients the possibility of avoiding renal failure and need for lifelong dialysis.

Are there any risks associated with nephron-sparing surgery compared with removing the whole kidney?

Nephron-sparing surgery is a technically more difficult operation than simply removing the entire kidney. As it involves removing the tumour from the kidney, there may be bleeding from the raw surfaces of the remaining kidney defect, or urine leakage around the kidney, which may result in post-operative infection and prolonged hospital stays. Thankfully, such complications are not common, the large majority of patients have an uneventful recovery, and NSS cancer outcomes are similar to radical nephrectomy.

How is nephron-sparing surgery performed?

Nephron-sparing surgery involves five main steps: (1) identify the tumour in the affected kidney; (2) clamp the blood vessels supplying the kidney to minimise bleeding; (3) remove the tumour with a 1cm-rim of healthy tissue around it to avoid leaving cancer cells behind; (4) close the defect left in the kidney tissue, and (5) remove the clamps off the blood vessels and check for bleeding before closing up (Figure 2).

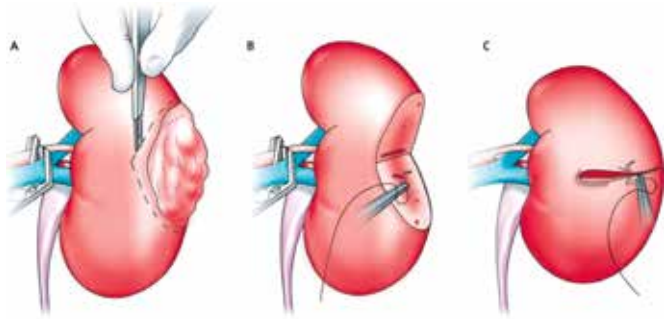


Figure 2: Steps of nephron-sparing surgery for early kidney cancer

NSS may be performed through three approaches: (1) traditional open surgery, which involves a 15cm to 20cm incision in the abdomen or flank; (2) laparoscopic surgery, which is performed through small incisions in the abdomen; or (3) robotic surgery, using the da Vinci® surgical robot to remove the tumour and sew up the resulting defect in the affected kidney. Minimally invasive surgery, with or without robotic instrumentation, offers many advantages over traditional open surgery – small incisions result in significantly less pain, much quicker recovery, shorter hospital stays and earlier return to daily activities. For open surgery, many patients complain of chronic pain or numbness over the large incision (Figure 3).

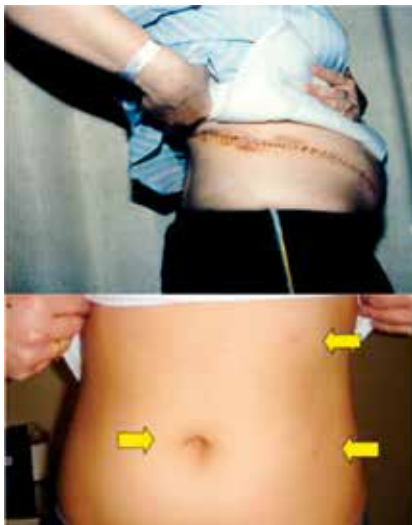


Fig 3(a): Patient with conventional open kidney surgery scar
Fig 3(b): Patient with minimally invasive nephron-sparing surgery scar

In minimally invasive NSS, the surgical challenge lies in minimising the clamp time on the vessels supplying the affected kidney. The longer the clamp time needed for excising the tumour and closing up the defect, the longer the kidney nephrons are starved of oxygen (known as warm ischaemia). Warm ischaemic clamp times of more than 30 minutes have been found to be associated with irreversible loss of kidney function. The enhanced clarity of vision and dexterity that the surgeons have using the da Vinci® robot to achieve the same goals of tumour excision and kidney reconstruction significantly reduce the clamp time on the kidney vessels and the incidence of post-operative complications, compared with surgeons using conventional laparoscopic instruments. Several published studies now validate the superior results achieved with the robotic approach over laparoscopic and open surgery (Figure 4).⁴

I was told by my doctor that my kidney tumour is large and /or complex and I should have the entire kidney removed. Is robotic nephron-sparing surgery still safe for my type of cancer?

With surgeons worldwide increasingly adopting robotic nephron-sparing surgery as their preferred mode of treatment, many centres have reported impressive outcomes for robotic NSS in dealing with such challenging cancers.⁵ Such complex cancers previously deemed as too difficult for NSS to be performed safely are no longer daunting for experienced robotic surgeons as the repertoire of surgical techniques for handling such scenarios continue to evolve. You should explore all available options by consulting surgeons with considerable expertise in dealing with such challenging cases.

What kind of outcomes can we expect with successful nephron-sparing surgery for early kidney cancers?

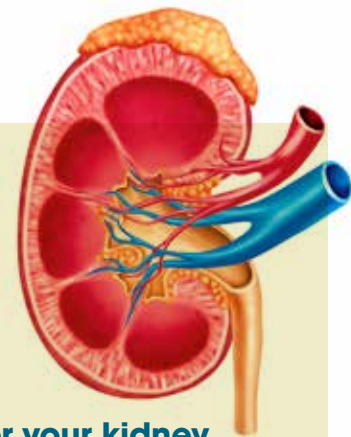
Stage 1 kidney cancers carry a very good prognosis if they are removed early without having positive margins. In such patients, there is an 85% to 90% chance that at 10 years after surgery, there will be no cancer recurrence. In healthy patients who have undergone successful nephron-sparing surgery of the affected kidney, their long-term quality of health is almost comparable to a patient of similar age with two healthy kidneys.

What would you say to a patient with newly diagnosed early kidney cancer?

Early kidney cancers carry an excellent long-term prognosis if diagnosed and removed early. There is a 20% chance that such suspected cancers will turn out to be benign lesions. Kidney-sparing surgery has now become the standard of care for such early cancers. Where the surgical expertise is available, nephron-sparing surgery using the da Vinci® robot has been found to deliver the best surgical outcomes in terms of minimising blood loss, warm ischaemia clamp times, and post-operative complications such as urine leaks. In this age of technological advances, patients should no longer have to lose their entire kidneys for such early tumours, particularly if these turn out to be benign on final analysis.



Fig 4: Repertoire of da Vinci® robotic instruments and their range of movement compared with the human wrist



Patient Story

Interview with Dzul Bar

How did you find out you likely had kidney cancer? How did you come to terms with the diagnosis?

Mr Bar: It all started when I went for my executive health screening. Results came back that they detected a shadow on my left kidney. I was recommended to do a CT scan for further in-depth investigation four days later. Result was fast, and it was confirmed that there was a tumour/growth of 5cm in size on my kidney. Not much of a symptom developed other than severe/acute backache encountered two days after the CT scan, wherein I was administered with painkiller initially. It was shocking news to be informed that I have kidney cancer and that the severity could be extreme. However, I was referred to Dr Gerald Tan (Gerald Tan Urology + Robotics) within days. During consultation, Dr Tan was very focused, and he explained to me the “whys and hows” of kidney cancer as well as the surgery procedure. As he is a great surgeon and an expert in his field, and he answered all my questions about the procedure, I immediately felt extremely at ease and comfortable under his expert care.

How did it affect your job and personal life?

Mr Bar: Surprisingly, it didn't affect my job and personal life much. My employer was very understanding and supportive of such treatment and my well-being. As for my personal life, it was a shocker initially. However, after accepting the fact that I have kidney cancer and soon undergoing major surgery, I have to be positive to overcome such setback. Surrounded with lots of love, support, encouragement, as well as prayers from loved ones, family and friends, I am more determined that I will be fine soon.

You underwent robotic kidney-sparing surgery for your kidney tumour. What was your experience of the surgery and post-operative recovery?

Mr Bar: As a well-informed patient, I was rather optimistic of the robotic kidney-sparing surgery. Dr Tan gave me a CD of how the robotic keyhole surgery is going to be like, and it helped me tremendously. All doctors involved were great, and the surgery at Mt Elizabeth Novena Hospital went very well. There was no complication throughout the surgery, and I was immediately back in my room for recovery. There was not much pain thereafter as well. I highly recommend the keyhole surgery as it is less invasive, with minimum loss of blood and speedy recovery. I was up on my feet, sitting down and walking 19 hours after the surgery. That's pretty amazing, indeed!

Interestingly, the final laboratory report of your 5cm kidney tumour turned out to be benign. How did you feel when you heard this news?

Mr Bar: I was ecstatic when final report came that the tumour was benign and that we were fast with the decision to extract it. Dr Tan managed to save 80% of my left kidney. I would advise that everyone should go for their health screening for prevention and early detection.

What further follow-up did the doctor recommend for you after your surgery?

Mr Bar: I was also referred to Dr Stephen Chew for my kidney as well as hypertension. I am currently on every three-month consultation period. As with Dr Tan, so far I am recovering very well from the surgery, and my scar is disappearing, too. I also have to see him on a yearly basis to check how my left kidney is progressing. eh

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Dr Tan Yau Min, Gerald is a Consultant Urologist at Mount Elizabeth Hospital with over 17 years of clinical experience. He is internationally renowned for his expertise in minimally invasive and robotic surgery for prostate, kidney and bladder diseases. Dr Tan was one of the first surgeons to pioneer robotic nephron-sparing surgery in Asia. He was named the Outstanding Young Urologist of Asia by the Urological Associations of Asia in 2012. He may be contacted via email at enquiries@drgeraldtan.com.sg.