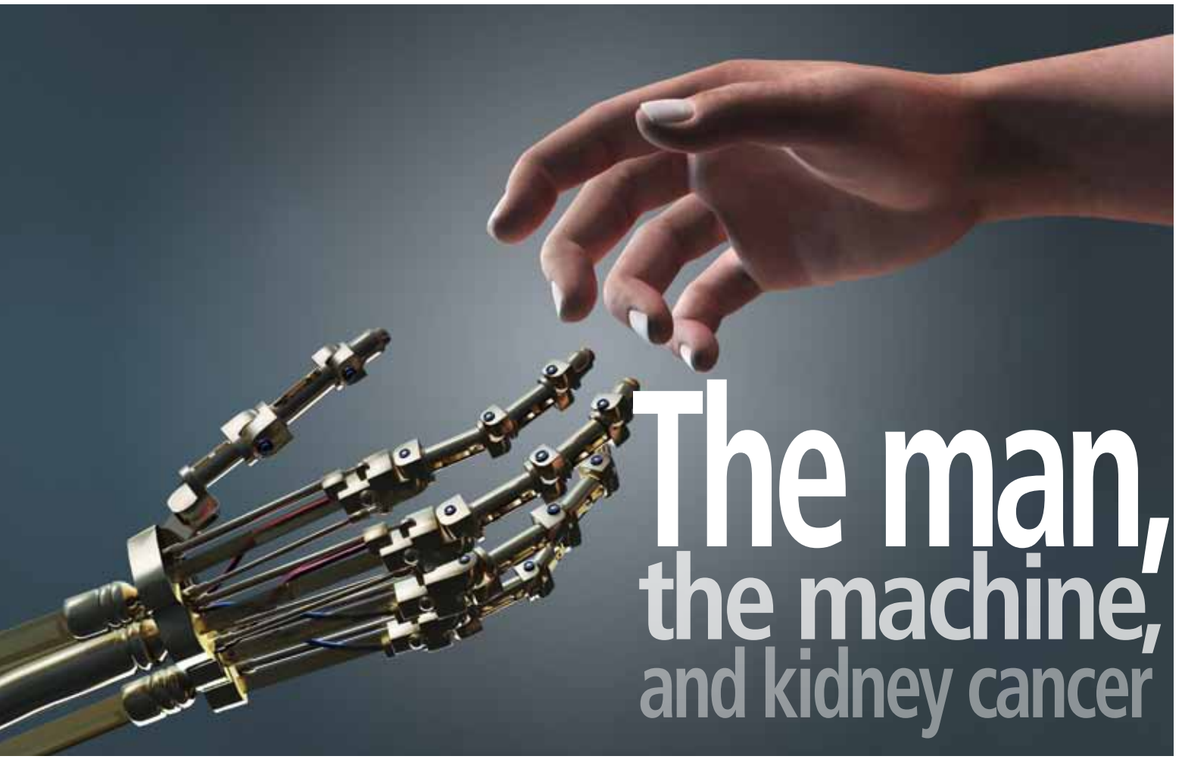

The man, the machine, and kidney cancer

Robotics has vastly improved the procedure and the outcomes of partial nephrectomy, writes ***Dr Gagan Gautam***

Robotic surgery has now entered the second decade since its inception around the turn of the century and is now all set to revolutionise the way complex surgeries are performed. There are over 2,000 surgical robots in the world today (>1500 in the US and ~ 20 in India) and they are increasingly being employed for the surgical treatment of various cancers.

ADVANCED ROBOTIC SURGICAL SYSTEM

The most advanced robotic surgical system in the world today is the Da Vinci Si HD system developed by Intuitive Surgical (Sunnyvale, California, USA). It comprises a console, patient side robotic machine and another cart, which houses the display monitor and lighting equipment. The surgeon sits at the console and through futuristic 'master controls' initiates and controls the movements of robotic arms, which translate the movements of the surgeon to the robotic instruments inside the patient's body. This system affords extremely precise and delicate movements made possible by the extreme miniaturisation and flexibility of these special robotic instruments. Surgeon tremor is completely eliminated and the movements can be scaled (3:1) for greater finesse. Accompanying these advances in instrumentation, is the superb high definition magnified 3D vision of the operative field that the surgeon gets while sitting at the console of this robotic system. This enables the surgeon to see and appreciate minute structures inside the human body, thereby making surgery potentially safer and more complete – aspects, which can be vital to a cancer patient.

ROBOTIC PROSTATECTOMY

Surgery for prostate cancer or robotic prostatectomy is by far the most common procedure performed with robotic systems in the world today. Another condition in which the application of robotics is being considered a big step forward is kidney cancer. Although relatively rare, kidney cancer is unique in being almost 100 per cent curable if detected at an early stage when it is confined to the kidney. It is also almost 100 per cent fatal if it is detected at a stage when it has spread to other parts of the body. Moreover, radiation and chemotherapy have been shown to be quite ineffective in this disease, thereby leaving surgery as the only effective recourse.

RADICAL VS. PARTIAL NEPHRECTOMY

Surgery for kidney cancer broadly encompasses two separate types of operations: radical nephrectomy (in which the entire kidney is removed along with the tumour) and partial nephrectomy (which entails selective removal of the cancerous portion of the kidney, sparing the rest).

Radical nephrectomy may be necessary in situations where the size of the tumour is large (typically more than 7 cm in greatest dimension) or when the location of the tumour makes it impossible to remove the tumour safely and completely without removing the entire kidney (as in the case of a tumour situated next to the main blood vessels of the kidney). The removal of the entire kidney, however, comes at a cost.

The decrease in overall kidney function causes an adverse impact on the cardiovascular system and increases manifold the chances of life-threatening complications later in life, such as heart attack and stroke. Moreover, in the long-term, the chances of kidney failure and dependence on dialysis also increase significantly.

ADVANTAGE PARTIAL NEPHRECTOMY

While radical nephrectomy may be inevitable in certain situations, most of the smaller and early stage tumours can be dealt with by partial nephrectomy. In fact, it is universally acknowledged by all major cancer guidelines and medical associations that a partial nephrectomy achieves equal cancer cure for smaller tumours (<7 cm) as compared to a radical nephrectomy. At the same time, it enables the preservation of the maximum amount of normal kidney tissue and decreases the chances of heart attacks, strokes and dependence on dialysis. So overall, patients with small tumours in the kidney are likely to live longer, healthier lives, if they choose to undergo partial nephrectomy rather than radical nephrectomy.

Though there are a number of ways of doing a partial nephrectomy (open, laparoscopic and robotic), robotic surgery has recently completely transformed this type of kidney cancer treatment. In a number of major cancer centres in the western world, robotic surgery is now being used to perform over 90 per cent of the total partial nephrectomy surgeries. The advantages of robotics in this operation are ample – excellent vision and dexterous fine instruments enable precise removal of the tumour and reconstruction of the remaining kidney with superior results and decreased complications.

IN MAJOR CANCER CENTRES IN THE WEST, ROBOTIC SURGERY IS NOW BEING USED TO PERFORM OVER 90 PER CENT OF PARTIAL NEPHRECTOMIES

Since the operation is performed through small 'keyhole' cuts as opposed to big open incisions, the patient recovers faster, experiences less pain and is able to become fully active much earlier than conventional operations. Moreover, blood loss during the operation is significantly reduced and over 95 per cent of patients do not require blood transfusion, thereby decreasing the transmission of blood-borne infections.

THE COST FACTOR

The technology, however, doesn't come cheap. The purchase and maintenance of the robot comes at a cost, which invariably finds its way into the patients' hospital bills. The cost of using the robot inflates surgery charges by about a third, but some of this increased expenditure gets offset by the decreased hospitalisation and medications required post surgery. However, with the next generation of robotic systems now on the horizon and with newer companies set to launch these machines, the competition is bound to heat up, thereby driving costs down. In the near future, undergoing a robotic operation may not prove to be any more expensive than a conventional operation.

There is, however, one important caveat that must be kept in mind prior to undergoing robotic surgery. Like any new technology, robotic surgery has a definite learning curve and requires specific training and experience in this modality. It may take up to 200 cases for a surgeon to become proficient in robotic surgery and become comfortable with this interface, which is completely different from open and conventional laparoscopic (keyhole) surgery. Although the technology is superlative, credit is still due to the man behind the machine that delivers the results. HR

EXPANDING AMBIT

As the awareness regarding robotic surgery spreads in the country and as more and more robotic systems are installed in Indian hospitals, it is inevitable that an increasing number and types of procedures will be performed with the help of this technology.

Already, the robot is being used in a variety of different surgical specialities, including gynaecology, head and neck surgery and cardiac/thoracic surgery. The ambit is only going to expand in the future. And this should translate into a significant improvement in the surgical care currently available at medical institutions.

Since this technology eliminates human error on the part of the surgeons, it enables them to provide a relatively pain free, safe and effective solution for a gamut of diseases.

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