

# INDIA TODAY



**ROBO DOC:**  
Dr Arvind Kumar  
of AIIMS now  
prefers to  
perform his  
thymectomies  
robotically

**WHAT HAS  
CHANGED  
FOR THE  
SURGEON  
& FOR YOU**



Looking down at a patient during surgery is passé. Monitoring on TV or via consoles is in. Surgery is more precise. Less trauma for patient.



Life gets simpler for both surgeon and patient as simple tools get camera-tipped and versatile robotic "hands" enter the OT \*



Minimally invasive is the mantra, as big incisions give way to "key-hole" surgery. Recovery is fast and easy.

INDIA  
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health SURGERY

CUTTING  
EDGE

With technology taking away much of the blood-and-gut messiness of surgery, modern operating rooms get closer to the world of *Star Trek*. For the patient this means speedy recovery and less pain but also a much heavier medical bill.

By Damayanti Datta

The operation taking place in the green tiled operating room at the All India Institute of Medical Sciences (AIIMS) is almost eerie. The patient, anaesthetised and swathed in blue drapes, is lying face up on a narrow table. But no one is touching her. Instead, the lead surgeon, Dr Arvind Kumar, sits some distance away, bowed over what looks like a video-game console. Yet action is taking place. As Kumar's thumbs and forefingers hit the controls, a four-

armed robot springs to life. Nurses, technicians, doctors stand motionless, staring at a sea of monitors, while tiny metal "fingers"—inserted through pencil-sized holes in the patient's chest—carry out Kumar's commands: clamping, cutting, sewing.

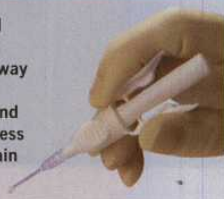
The AIIMS robot may not intone, "This won't

hurt a bit", like C3PO of *Star Trek*, but surgery in the new millennium has gone through a galactic change. Technology is now the driving force, minimally-invasive the gold-standard and precision the mantra. Doctors mindmeld with machines, target drugs and instruments, don't use hands to

Bleeding was controlled by electricity or ultrasound once. Today electrothermal systems ensure minimum loss.



Sutures and staplers are now giving way to tissue adhesives and soldering. Less scar, less pain for patient.



Thanks to new generation CT, MRI and PET scans, doctors can explore every nook and cranny. Diagnosis much more accurate.



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### health SURGERY

make a cut and with radical improvements in medical imaging, access parts of the body as never before. "Surgery may not yet feature *Star Trek*-ian techniques, but in some regards they are on the way," says Dr Naresh Trehan, the cardiologist who pioneered robotic surgery of the heart in the country in 2002.

Check out the surge of "first-ever" surgeries all across the country: in August, nerve electrodes enabled a ventilator patient to breath normally at AIIMS; in July, doctors at Jaslok Hospital in Mumbai performed a dual pacemaker surgery; in June, AIIMS achieved a landmark in robotic chest surgery. In March, at Bangalore's Narayana Hrudayalaya, "Asia's first artificial heart" was implanted. In January, tissue glue was used to fix up an intraocular lens in Chennai. Last year, orthopaedics replaced a patient's kneecap totally in Delhi, while artificial spinal discs were put in Mumbai and Bangalore. In 2006, Asia's first "Brain Suite"—the most advanced technology to treat brain tumours—was launched at the Institute of Neuroscience, Max Hospitals, in Delhi. In 2003, almost like science fiction, Drs G.V. Rao and Nageshwar Reddy at the Asian Institute of Gastroenterology, Hyderabad, removed an appendix through the mouth—the first in the world.

Driven by the rising health-care demands and spending power of India's affluent generation, medical technology looks set to enter a golden age. A new Ernst & Young study predicts 15-20 per cent growth for the Indian medical equipment market, slated to reach to \$5 billion by 2012, from \$2 billion now. "That doesn't necessarily mean treatment will be cheaper," says Kumar, professor of surgery at AIIMS. "But it promises to deliver more for the money. Almost certainly, it will be less dangerous and painful for patients."

From February this year, Ela Srivastava, 21, of Kanpur started getting periods of extreme weakness, when doors were too weighty to open, stairs too difficult to climb, food too hard to chew, eyes too droopy to focus. She suffered the ultimate onslaught—respiratory failure and paralysis—in May. It was a rare neuromuscular disorder and demanded a fierce chest surgery with large incisions sawed straight through the breastbone. But in June, when Kumar operated on Srivastava at AIIMS—one of the five robotic surgery centres in India—no rib or muscle was torn asunder, no nerve crushed and the patient could walk on her own within 48 hours.

**THE NEW-AGE OT**  
Rapidly advancing technologies are changing operating rooms at astonishing speed and daring surgeons to keep up

**ENDOVISION**  
For endoscopic surgery. Digitalised X-ray images and endoscopy findings can be directly transmitted to the surgeon's screen.

**ELECTROCAUTERY**  
The crude old machine for cutting tissue and stopping blood loss during surgery is now a sophisticated electrothermal system

**ENDOVISION**  
System used for the robot. Has high-resolution digital camera, direct recording on computer and high-resolution monitors for 3-D visualisation.

**ROBOT**  
Tiny cameras attached to the four arms are inserted into the patient. Each arm has surgical instrument attached to it. The operation is done through pencil-sized punctures, as surgeon commands via a console.

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Forty years ago, when Trehan was a student, most devices in the operating room (OR) were rigid, allowing a few relatively simple procedures to be carried out with safety. Even in the '80s, gadgets were cumbersome and bulky, the operating table had to be cranked up or down with a jack and the overhead light fixed manually. Today, the OR looks more like a space capsule. Press a button and the table moves, in any angle and on any plane. Overhead lights are now aerodynamically controlled, with satellites lighting up hidden recesses of a patient's body. The crude electrocautery machine has given way to electrothermal Vessel Sealing Systems to control bleeding. From suturing, surgeons have moved on to staplers, while waterproof, biodegradable tissue adhesives and laser-assisted soldering are entering the OR. The old anaesthesia unit is now a "workstation", with sophisticated ventilators and automated record-keeping. "Twenty years ago, you had to go to the X-ray department, check out the angiograms, the blood report and all that. Today all is available on screen, allowing one to monitor those constantly," says Trehan. Not just that, the brick-and-mortar rooms are giving way to modular chambers, with fewer sharp edges to deter germ accumulation.

Equipment often hang from the ceiling for utmost hygiene. "Today's ORs are 20-25 per cent bigger," says neurosurgeon, Dr Sharad S. Kale of AIIMS. The state-of-the-art OR under construction at AIIMS will not only be enormous, it will have four satellite rooms to house all the new technology.

The glut of new technology corresponds to the "third revolution" in modern surgery (the first two came with antiseptics and anaesthesia). "At one time, the saying was, 'Big surgeon, big incision'," says Kumar, "now it's 'Big surgeon, small incision.'" Traditional surgery involved incisions large enough for the surgeon to put both his hands inside the patient's body. Since the '90s minimally invasive surgery (MAS) allowed surgeons to work through small punctures (or "keyholes") using chopstick-like tools teamed with a tiny camera. Instead of looking down at the patient, the surgeon looks up at enhanced images thrown up on a TV monitor. But "keyhole" surgery is counterintuitive: to move an instrument's tip to the left, surgeons have to push the handle to the right and vice versa. The 2-D monitor compromises depth, and the tools take away a lot of the touch sensation. Robotics, the next stage in surgery, takes the tools out of a surgeon's hands, performs precise move-



BANDEEP SINGH

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#### IN THE PIPELINE



**Water Jet:** High pressure stream of water, used as a cutting tool in industry, is ready to be used for cutting tissues



**Telesurgery:** Surgeons have started using remote-controlled robots to operate on patients across continents



**Go Virtual:** Soon research will enable surgeons to scan patients, create 3-D images and practice before the real surgery



**Robot Brain:** Let a robot use its brains to operate on a virtual patient and use it as a blueprint

#### NEW BREAKTHROUGHS IN SURGERY FROM ACROSS THE COUNTRY



**WHEN:** 2008  
**WHAT:** Implanting dual pacemakers for the first time in India.  
**WHERE:** Jaslok Hospital and Research Centre, Mumbai



**WHEN:** 2008  
**WHAT:** Robotic chest surgery on thymus gland  
**WHERE:** All India Institute of Medical Sciences, Delhi



**WHEN:** 2008  
**WHAT:** Asia's first artificial heart implant  
**WHERE:** The Narayana Hrudayalaya hospital in Bangalore



**WHEN:** 2008  
**WHAT:** Tissue glue used to fix up intraocular lens  
**WHERE:** The Aggarwal Hospital, Chennai



**WHEN:** 2007  
**WHAT:** Knee cap replacement; artificial discs in spine  
**WHERE:** AIIMS, Bombay Hospital, Hosmat Institute, Bangalore



**WHEN:** 2006  
**WHAT:** Asia's first "Brain Suite" to treat brain tumours  
**WHERE:** Institute of Neuroscience, Max Hospital, Delhi

ments in tiny spaces—without trembling like a tired surgeon's might—and gives him 3D vision."

"None of this would be possible without a vital adjunct—molecular imaging technology," says surgeon and cancer specialist Dr Harit Chaturvedi of the Rajiv Gandhi Cancer Institute and Research in Delhi. "Later versions of Computed Tomography, Magnetic Resonance Imaging and Positron Emission Tomography scanners have ensured that there's no nook or cranny in the human body where a tumour or a disease can hide." Track the change in neurosurgery. "In the past, the difficulty in distinguishing between diseased and healthy brain tissue needed a follow-up MRI a day or so following surgery," says Kale. That delay will be eliminated soon at AIIMS with high field-strength intraoperative MRI—literally bringing imaging to the patient in the surgical suite. On the horizon are the newer, even less-invasive approaches of surgery through natural orifices (Natural Orifice Transluminal Endoscopic Surgery). "The mouth, anus or vagina are used to pass fibre-optic instruments inside the body," says Rao. "The fall-out is minimum scar, pain and trauma."

At the root of all this lies modern India's interplay with the West. State-of-the-art technology was often brought in by Indian doctors who learnt their craft in the West. On some fronts, such doctors far outstripped the West. Most American cardiac surgeons still hesitate to perform "beating heart" surgery, which does not require stopping the heart or using a heart-lung machine. In India, it is increasingly commonplace. Globalisation added the rest of the fillip. Sandeep Sinha, senior healthcare analyst with

market intelligence, Frost & Sullivans (F&S), holds that the entry of cash-rich corporates into the healthcare fray changed the scenario: "They have the wherewithal to mobilise huge resources globally." Most new technology is being adopted fast by them. Being on the cutting edge makes a sensible business proposition.

New technology has also meant spiralling costs, says a F&S report, *Cost of Healthcare in India, 2007*. Consider: if the cost of a standard cataract operation in 2004 was Rs 35,000, with newer lenses coming into the market, it went up to Rs 42,110 in 2006—a 20 per cent hike in two years. If simple X-rays cost Rs 50 in the '60s, ultrasound images in late-'70s cost around Rs 300, CT scans in mid-'80s Rs 2,500, MRI by mid-'90s to Rs 5,000 and now the PET scans cost Rs 25,000. But despite the price war, doctors hold, it matters when someone can walk back home after a gall bladder operation the same day instead of spending a week.

After battling a long-drawn surgery, Kumar enjoys his personal ritual: reloading the hours spent in the or in his mind over a cup of steaming coffee. Today his mind wanders to the last nine months—of lobbying for a robot, spending a lakh out of pocket for getting trained abroad, not to mention tackling the logistical nightmare of a public institution. They say, new technology will end the era of the 'great man' in surgery. "If only," he smiles to himself. The robot has proved once again that the machine is the slave and the surgeon the master. "Technology will move ahead so long we stick to our mandate of staying at the cutting edge." ■