Future & New Developments in Robotic Surgery

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ORSI

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"The only thing that is permanent, is change"

1930, Dr. Mayo

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olv Topline Care.

History of Urological Surgery

Open surgery

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History of Surgery

3. Robotic surgery

olv Topline Care.

"Modern Times", Charlie Chaplin, 1932

Robot-assisted Surgery
Definition

= Computer-steered Master-Slave Telemanipulator, that can perform one single task under direct control of the operator. It allows manipulation of the instruments in the operation field.

Robotics in Urology

Why ??????

Answer:

This device offers us the possibility of doing laparoscopy in a natural "intuitive" way, with 3D vision & with instruments that are movable at their tips, allowing very precise handling.

erus

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3-D HD for everybody

Evolution of MIS Technology

1910-1999

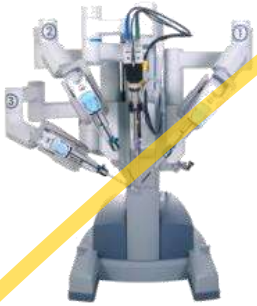
Traditional Laparoscopy

1999

da Vinci®

- Eliminates lap compromises
- Introduction of 4th arm (2003)
- Simple instruments

2006



da Vinci® S™

- 3D HD Vision (720p)
- Visual Inputs – TilePro
- Multi-quadrant access
- Streamlined set-up
- Procedure-specific and energy instruments

2009

da Vinci® Si™

- Dual Console option
- Enhanced HD Vision (1080i)
- Scalable architecture
- Advanced instruments
- OR Integration

Robotic Surgery

1999 : da Vinci standard system

3 arms

Robotic Surgery
2009 : da Vinci Si system
4 arms

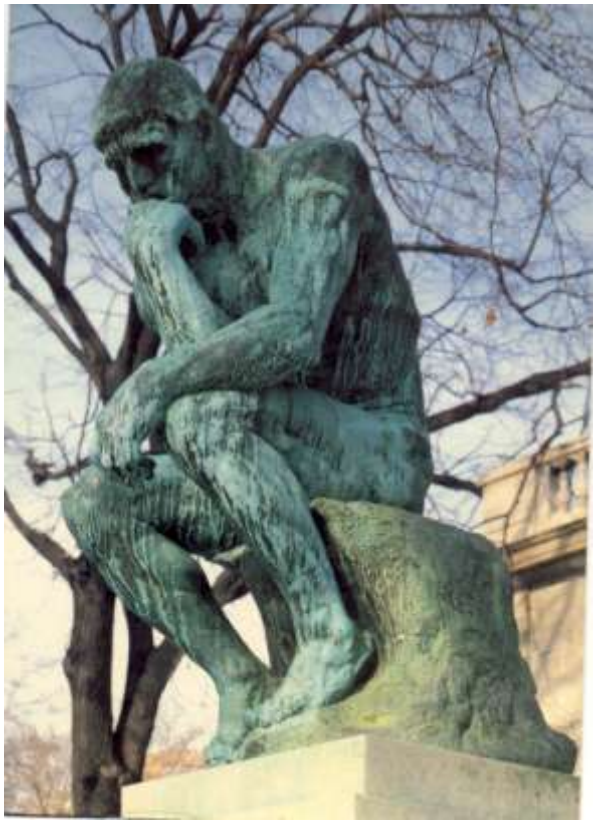
Robotic Surgery
2014 : da Vinci Xi system

Robotic Urology

Indications for

robot-assisted surgery

in Urology



Robot-assisted Surgery

Indications

- all procedures
- especially in ***reconstructive surgery & meticulous exeresis*** :

- **radical prostatectomy:** **- nerve-sparing**
  - anastomosis
- partial nephrectomy
- nephr(oureter)ectomy
- Pyeloplasty
- ureterreimplantation
- Colpopromontofixation
- cystectomy & urinary diversion
- vaso-vasostomy
- …

Indications

Major indication :

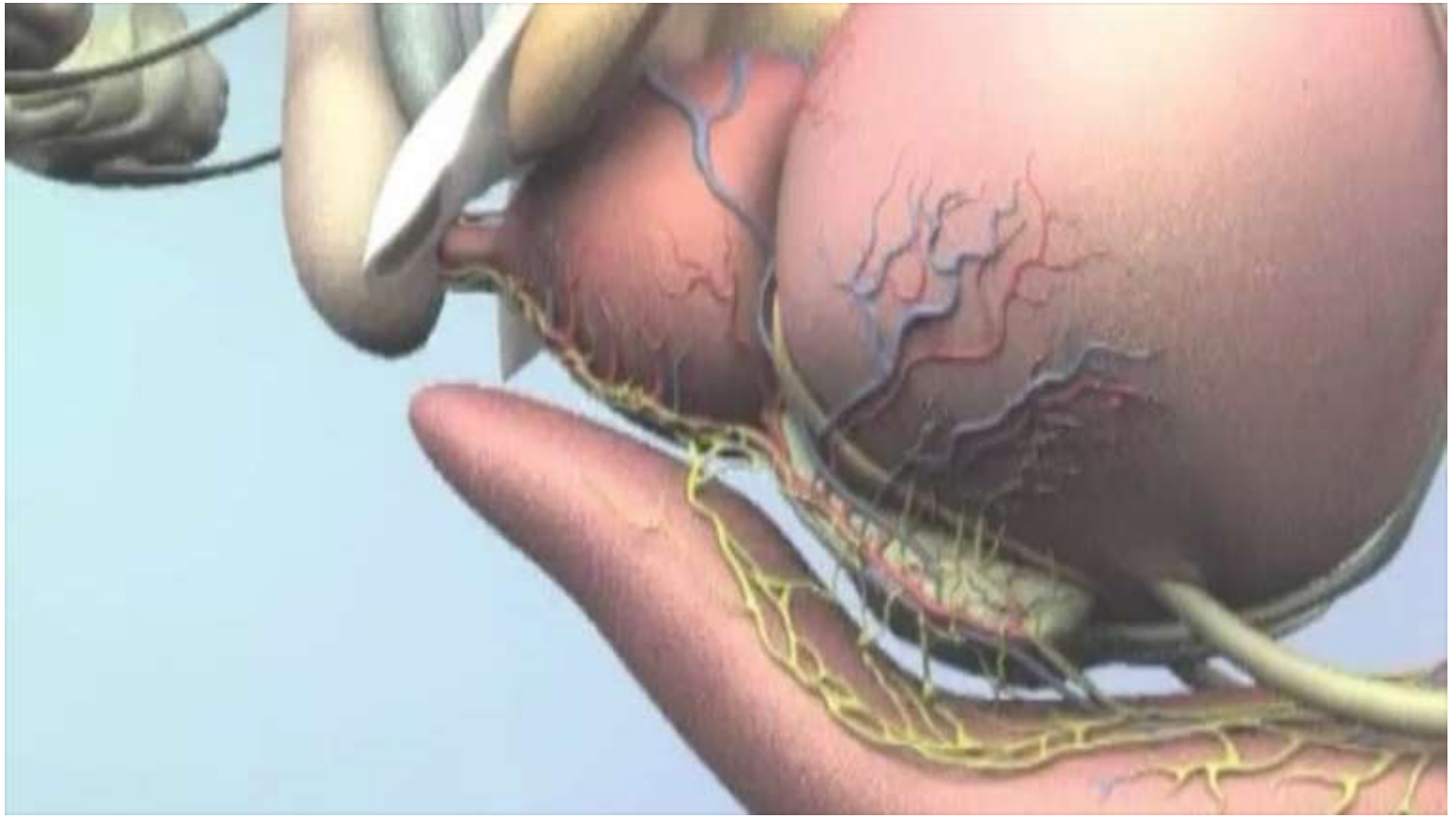
radical prostatectomy

Surgery is in constant motion
Looking for perfection to reach the ***"TRIFECTA"***

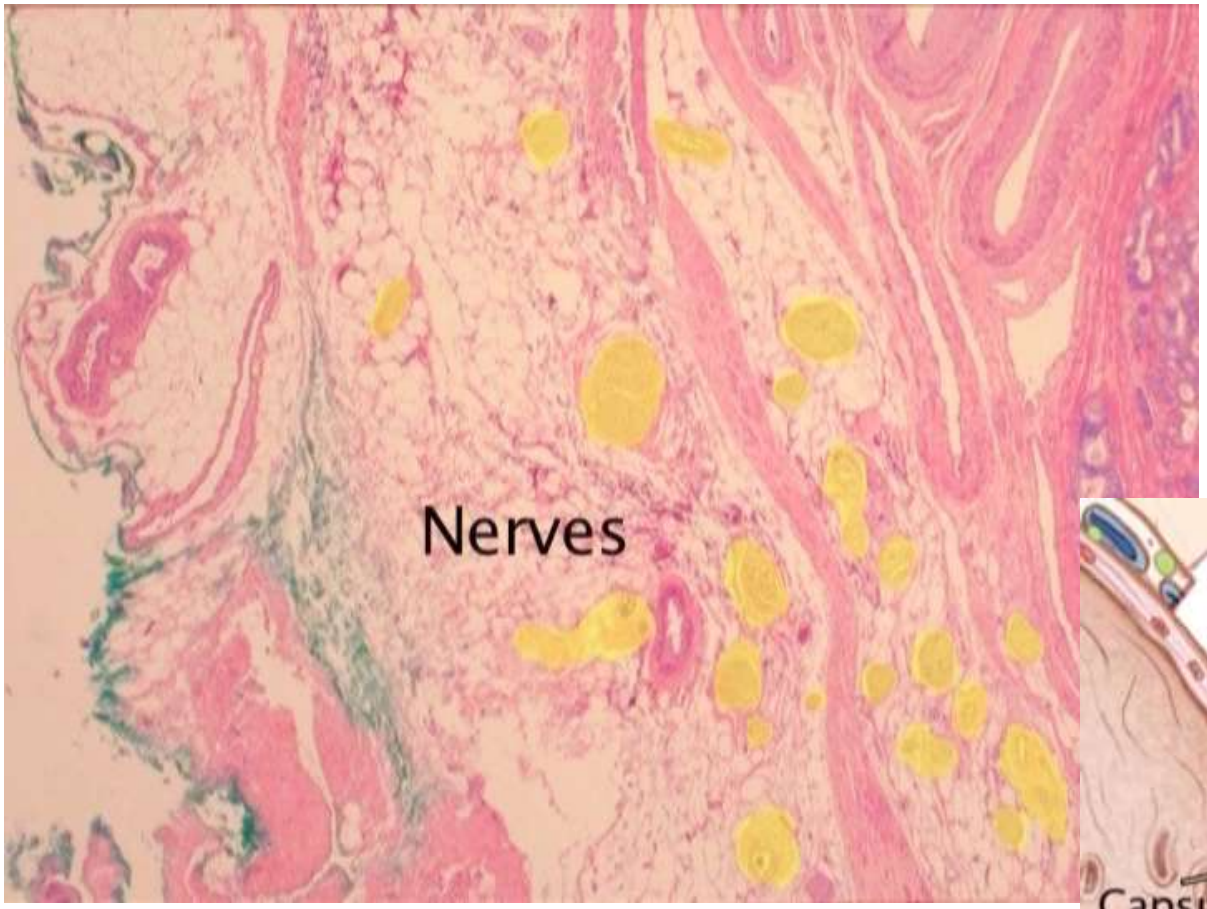
1. ***Cure*** the patient from his cancer
2. Obtaining early ***continence***
3. Preserving ***erectile function***

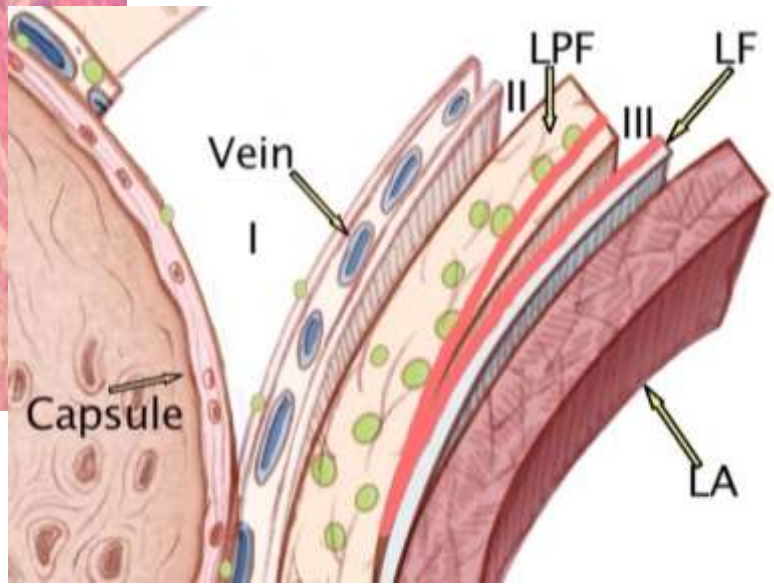
Robot-assisted Prostatectomy

Thanks to robotic surgery, more insights in microanatomy



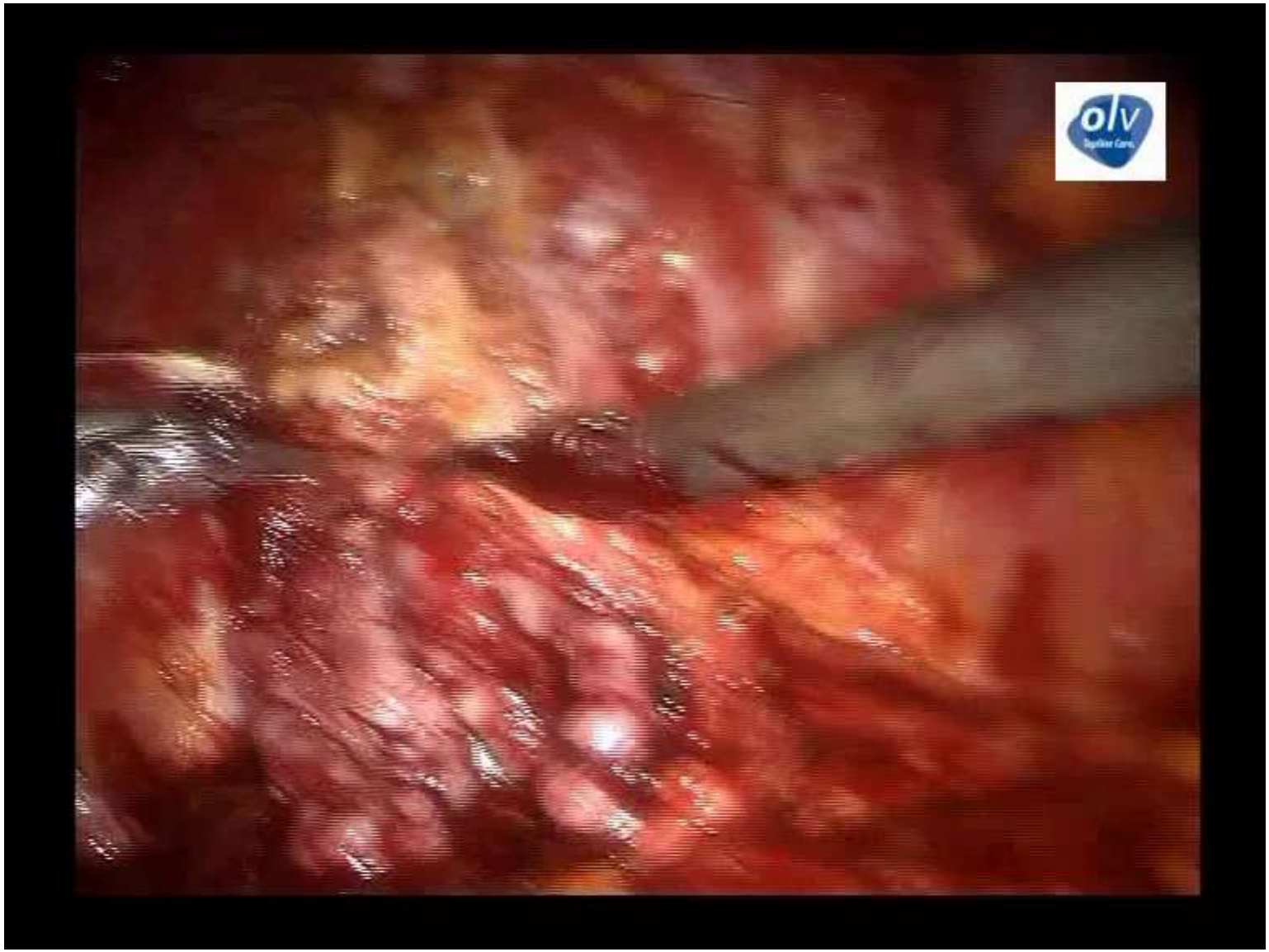
Surgical anatomy of the prostate





A. Tewari

Robotic Prostatectomy

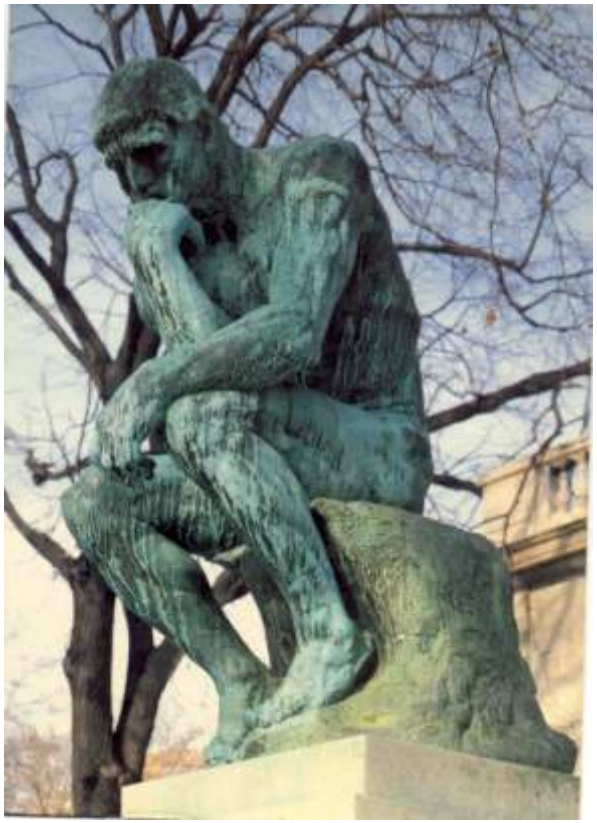


Robotic Urology

New Developments

in

Robotic Surgery



Robotic Surgery

What do surgeons want from new innovations?

1. Tissue recognition
2. Augmented reality
3. Miniaturisation

Image guided surgery
Tilepro

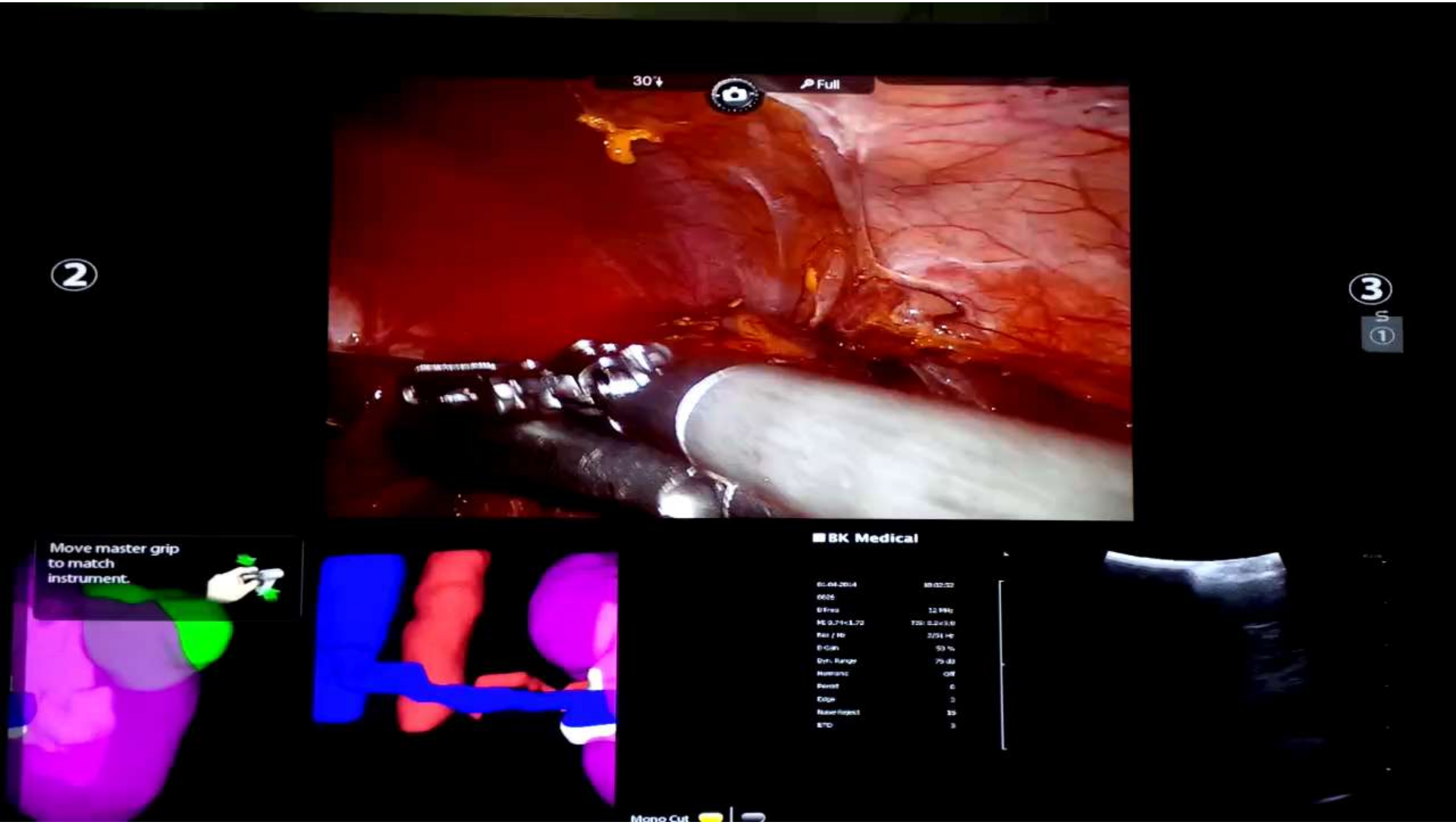
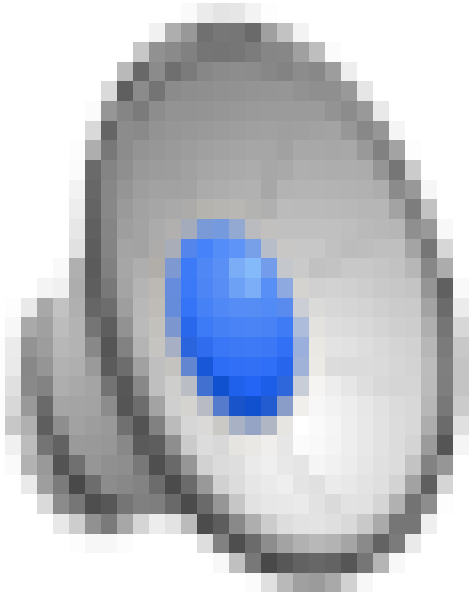


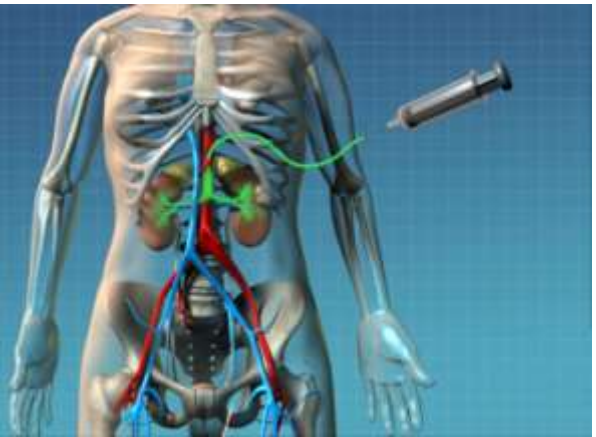
Image guided surgery
Tilepro



Fluorescence Imaging on da Vinci

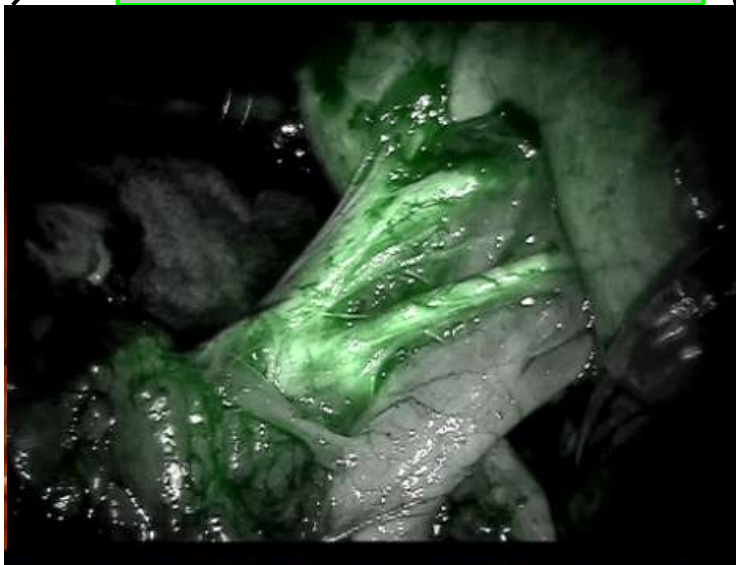
New camera head can pass fluorescence signal

Laser Excites IndoCyanine-Green and Fluoresces

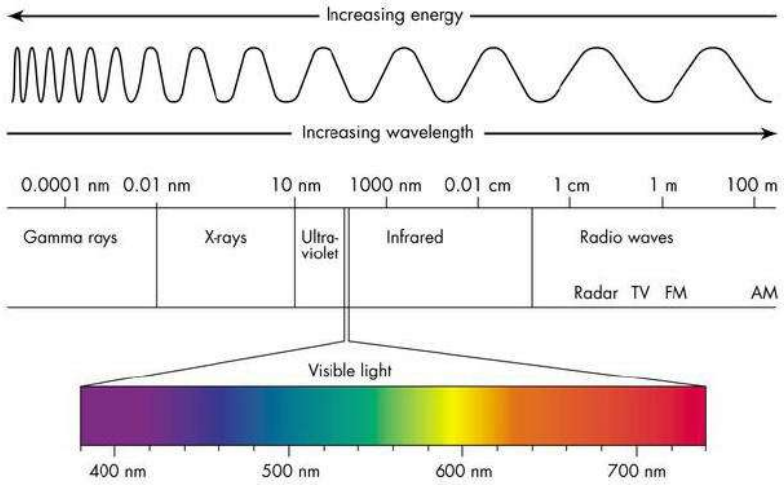


Fluorescing signal overlaid with green hue in surgeon console

Renal arteries - fluorescence mode (NIR)



Clinical Background: indocyanine green

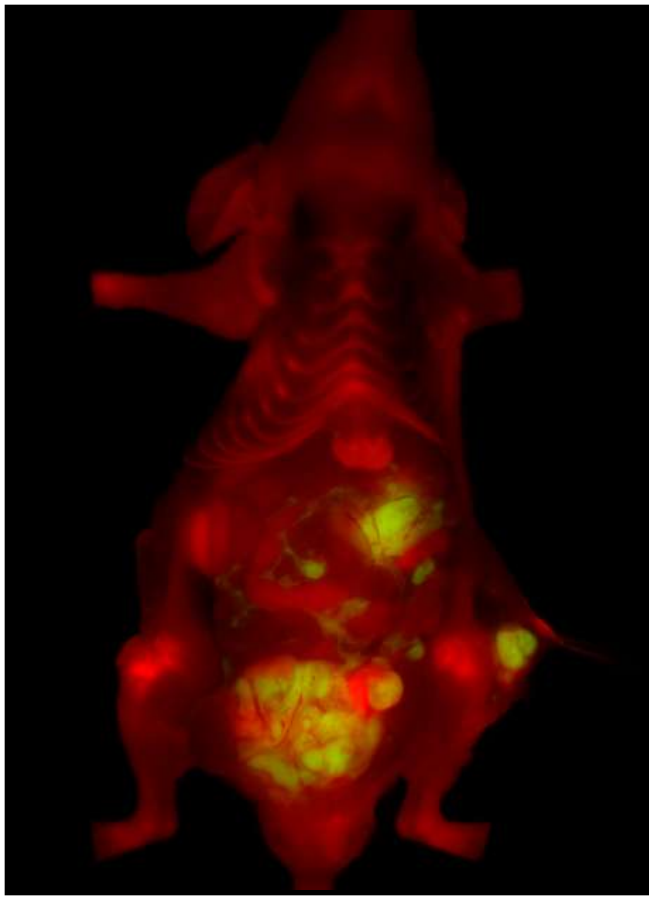


- **ICG binds to plasma proteins in blood after iv injection**
- **ICG is excited at ~806 nm and emits light at 830 nm**
  - **ideally suited for penetrating tissue, blood, and fat**
- **Fast uptake allows for multiple injections (2-5 min half life)**

IV injection →	**Blood Vessels** (artery then vein) →	**Kidney** →	**Liver Bile** →	(ducts to duodenum)
See within:	5-50 seconds	< 1 min	< 2 min	10's of minutes
Time lasts:	seconds	~20 mins	1-2 hours	1-2 hours

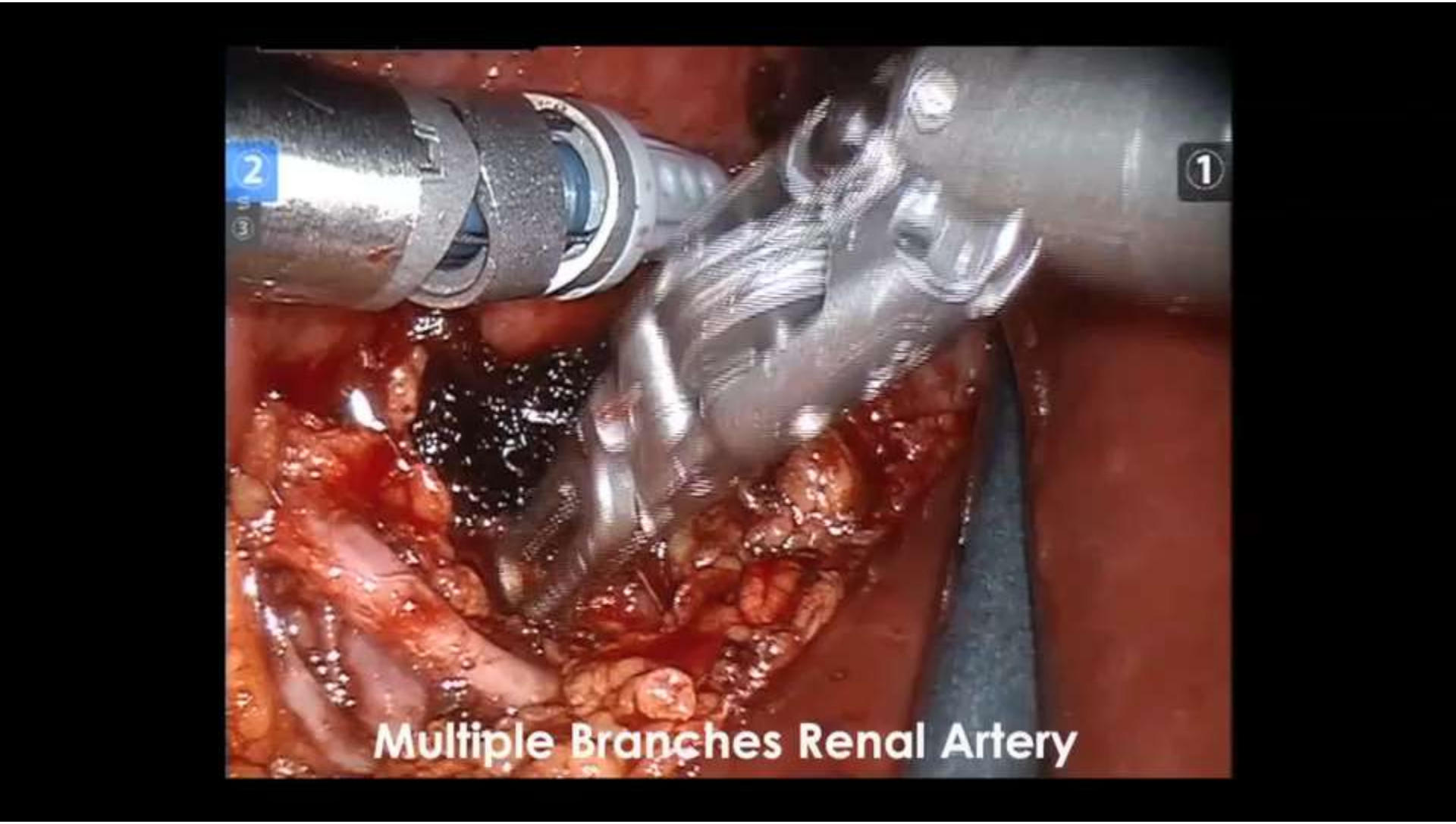
Fluorescence in Robotic Surgery

- **Kidney:**
  - Selective clamping
  - Effective clamping
  - Check vascularisation after partial
- **Bowel:**
  - proper vascularisation
  - Lymphnodes
- **Gallbladder:**
  - Choledochography.



Novadaq, Inc.

Robotic Surgery
Fluorescence

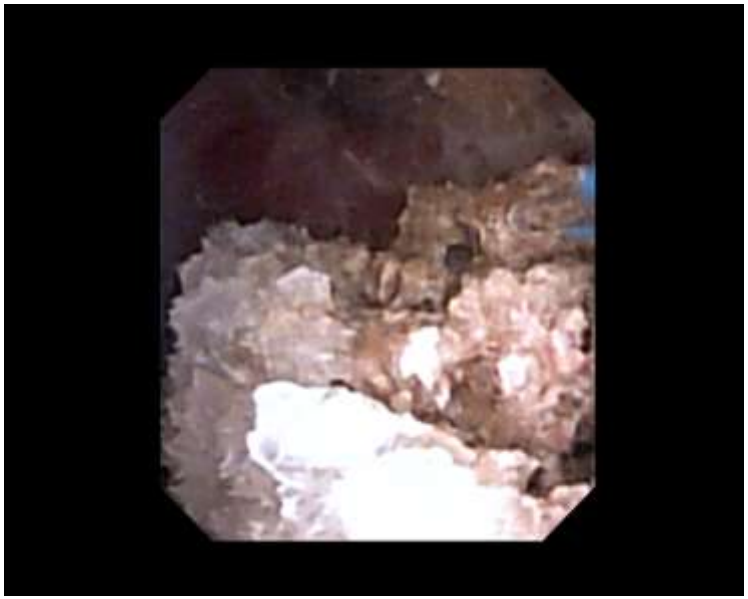


Upper tract Endoscopy

Console based robotic device

- Avicenna Robot (ELMED, Turkey)

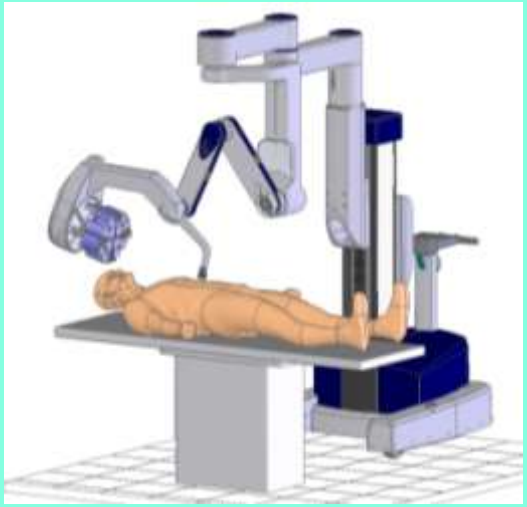
→ Console with fine movements (joy-stick, wheel) and footpedal for laser (N=28 cases)



Dusting the stone

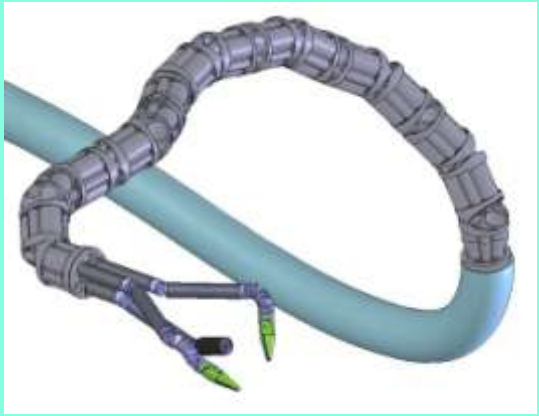
Advanced Single Port or NOTES

Single Port

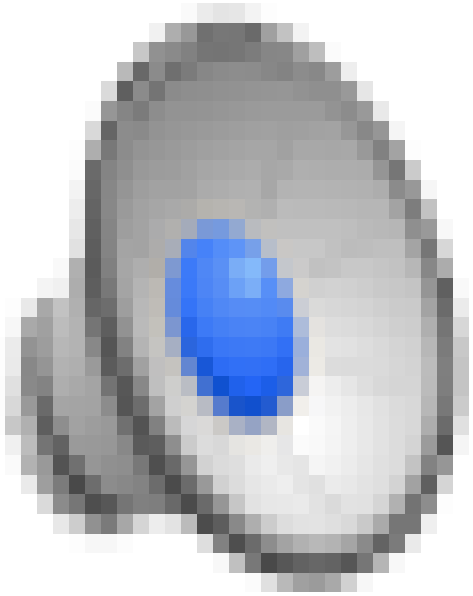


- Natural orifice / trans-umbilical
- *da Vinci*-like capability
- Large range of motion (multi-quadrant capability)

Flexible Systems



Robotic Surgery
2015? : da Vinci SP system
(Surgical Snake)



Mini Crab-Like Robot Removes Stomach Cancer

by Stanley Darma on Feb 2, 2012 • 12:47 pm

medGadget

Researchers from Singapore have developed **a small robot designed to remove stomach cancer in its early stages**. The mini robot resembles a crab, because it incorporates a pincer and a hook to do the job. The robot is **mounted on an endoscope** which reaches the stomach via the patient's mouth. Next to its size, another advantage of the robot is that it doesn't leave an external scar.

The crab-like robot has a **pincer to grab** the tissue to be removed, and the **hook can cut the tissue and cauterize** it to stop the bleeding. The operating surgeon can see what's happening through the little camera in the endoscope and control the robot's movements. These movements are very precise and accurate compared to movements made directly with human hands.

The robot has already been used to remove early-stage stomach cancer in as many as five patients in India and Hong Kong.

Japan's Ritsumeikan University researchers unveil a prototype model of the micro medical robot, measuring **1cm in diameter, 2cm in length and weighing only 5-grammes,** which enables it to stay and move inside a human body to remove or treat the affected part of disease, especially cancer.

The tiny robot incorporates various medical devices including a **small camera, sensors and a drug delivery injector**, which could reduce the need for surgery.

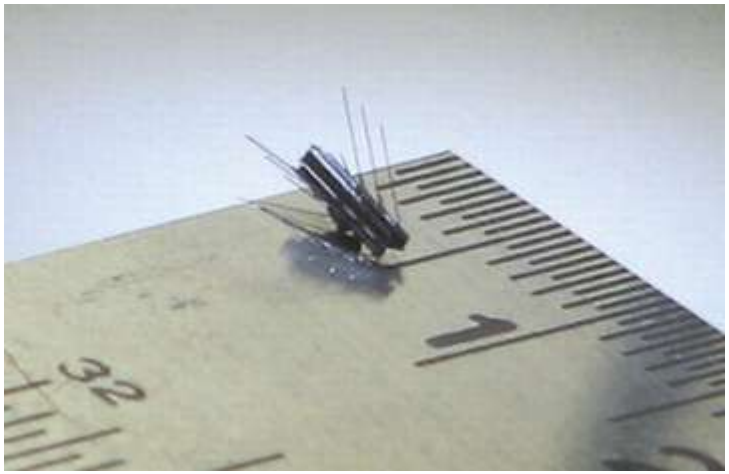
Data is sent to a computer through a slim cable although researchers hope to develop a transmitter.

Previously miniature robots for inside the body have been designed to be swallowed and can only take pictures, although US researchers are also working on a small robot that enters though an incision to treat heart problems.

Mini-robot swims through bloodstream

By Joshua Topolsky posted Jun 27th, 2007 at 9:57 AM

Two Israeli scientists may have created the catalyst for a medical revolution with their new project: **a tiny, 1-millimeter-diameter robot** which is capable of crawling through human veins and arteries. The bot can cling to vessel walls using small, powerful arms which protrude from a hub in its center. Manned control is accomplished by using a magnetic field outside of the body, and the robot is able to swim against the flow of blood, as well as squeeze through a variety of arterial openings. Right now the doctors don't know what the medical applications might be, though they speculate that a large number of the bots could be used to fight certain types of cancer.



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Aalst

Belgium

O.L.V. Vattikuti Robotic Surgery Institute

History

Non profit society

(created 2010)

Mission :

Offer high quality

training, exposure and R&D

in minimal invasive therapies

O.L.V. Vattikuti Robotic Surgery Institute

Future

ORSI wants to offer :

1. *Training platform*

2. *Clinical platform*

3. *Technology platform*

O.L.V. Vattikuti Robotic Surgery Institute

Future

ORSI Society wants to do to 'Partners & Industry' a unique proposal:

ORSI will:

- *offer* ***broad European platform*** *("inclusive")*
- *Offer the* ***unique concept of 3 platforms****.*
- *Unique team of* ***clinical multispecialty KOL's***
  > top case obsercations
- ***Link*** *technical innovation to clinical expertise*
- ***Diversification*** *to other minimal invasive innovative techniques*

➢ *today, collaboration with LMTC (KU Leuven), U Ghent, CREAX,…*

New Developments in Robotics

This is only the beginning…

"The future of surgery is not about blood and guts, it is about bytes and bits"

(R. Satava)