Robotic radical prostatectomy: our bridge to the future

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Robotic RP: our bridge to the future

- New personal challenge: to learn again
- Better understanding of pelvic anatomy and surgical steps also for open surgery
- Recently available devices:
  - Double console
  - Self-stabilizing sutures
  - Tile-pro
- Future developments: robotic LESS - NOTES
When starting a robotic program

- Many regard age 53 as a watershed between trainability and untrainability
- Perform some easy robotic steps under supervision
- Possibly apply for a training fellowship at an established robotic centre

Stöckle M.  ESU Course 2011
Better understanding of the anatomy: periprostatic fascia
Better understanding of the anatomy: periprostatic fascia
Better understanding of the anatomy: pelvic floor anatomy
Better understanding of the anatomy: bladder neck

Transverse section - bladder neck

Longitudinal fibers
Circular fibers
Better understanding of the anatomy: apex
Advantages of robotic surgery

- 3-D vision
- 7 degrees of freedom

Advantages of robotic surgery

- Ultraprecise dissection
- Filtering tremor
Where is the robot leading us?
Outcomes of Retropubic, Laparoscopic, and Robotic-Assisted Prostatectomy

J. Kellogg Parsons and J. Lisette Bennett

Conclusions:

• LRP and RALP: reduced blood loss and transfusion rates

• LRP, RALP and RRP show similar risk of positive surgical margin

• Further randomized studied are needed
Is the robot the best surgical option?

Retropubic, Laparoscopic, and Robot-Assisted Radical Prostatectomy: A Systematic Review and Cumulative Analysis of Comparative Studies

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\textit{Eur Urol} 2009;55:1037-1063

**Conclusions:**

- LRP and RALP: reduced blood loss and transfusion rates
- No proven superiority of RALP in terms of functional and oncological outcomes
- Further randomized studies are needed
Is the robot the best surgical option?


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Conclusions

Our analysis of large RRP, LRP, and RARP series with a sample size of 250 or more patients has led to the following conclusions:

- RRP, LRP, and RARP that are performed in high-volume centers are safe options for treatment of patients with localized prostate cancer, presenting similar overall complication rates.
- LRP and RARP are associated with decreased operative blood loss and decreased risk of transfusion when compared with RRP.
- Our analysis including high-volume centers showed lower weighted mean PSM rates and higher continence and potency rates after RARP compared with RRP and LRP. The lack of randomized trials and long-term follow-up studies that compare the three approaches, however, precludes definitive conclusions.

→ RRP, LRP and RARP safe options
→ LRP and RARP: reduced blood loss
→ RARP: lower weighted PSM, better continence and potency

No randomized trials available
The present: is the robot the best surgical option?

Nowadays it cannot be considered the best option in all cases.

However………individual patients outcomes can be maximized by choosing the best modality (RALP, LRP and RRP) based on:

- Comorbid medical conditions
- Cancer characteristics
- Surgeon experience

RALP probably entails: better continence and potency, earlier recovery and less pain, similar oncological results
The future of the robot: surgical cockpit

- Image Guidance
- $dV$ Network
- Training
- New Robots
- Advanced Instrumentation
Advanced instruments

Integrated Energy Instruments (today)
- Monopolar Energy
- Bipolar Energy
- Advanced Bipolar
- Harmonic
- Advanced Graspers
- Laser

Future Instruments
- Linear Cutters
- Seal and Cut
- Drills/Burrs
- Suction/Irrigation
**ICG**
- Central venous
- Interstitial

**Vasculature**

**Lymph Node Mapping**

**Specific antibodies plus fluorescing markers**
From medical images to minimally invasive intervention: Computer assistance for robotic surgery

Su-Lin Lee, Mirna Lerotic, Valentina Vitiello, Stamatia Giannarou, Ka-Wai Kwok, Marco Visentini-Scarzanella, Guang-Zhong Yang*

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**Comput Med Imaging Graph 2010; 33:34-45**

Fig. 6. (a) A phantom heart as seen through a da Vinci laparoscope. (b and c) AR visualization with inverse realism showing a superimposed artificial heart valve in relation to the cardiac structure.
From medical images to minimally invasive intervention: Computer assistance for robotic surgery

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Fig. 7. (a) Laparoscopic ultrasound probe (Aloka UST-5550) used on a phantom heart, as seen through the da Vinci laparoscope. (b) Augmented view using the inverse realism method, where ultrasound images (c) are shown in situ.
TilePro multi-input display

It allows the surgeon to view 3D video of the operative field along with two additional video sources (eg Ultrasound and EKG)

Reduction in basal positive margin: 9% to 2.3 %
In vivo microscopy

- Sub-micron *in vivo* histology
- **Real-time** functional and molecular imaging and diagnosis
- Tissue information (cancer, endometriosis, etc)

Flexible microscope  ❖  Frozen section analysis
daVinci Connect Network

- Teaching
- Supervising
- Remote surgery over long distance?
Surgeon training advancements

**Dual Console**
- New surgeon training
- New procedure mentoring
- Cross-specialty cooperation
- Shortened learning curve

**Simulation**
- User interface skills and tasks
- Surgery/Procedure skills (suturing)
Robotic single-port surgery

Laparoscopic Single Port Surgery

- 2D Vision
- Unstable Endoscope
- Counter-Intuitive Control

*da Vinci* Single Port Surgery

- 3D Vision
- Improved Ergonomics
- Stable Endoscope
- Tremor Filtering
- Intuitive Control
Robotic single-port surgery

- **Desai MM**: transvesical RP in a cadaver model with a transvesical single port-device
  
  *Desai MM et al BJU 2008;102:1666-1669*

- **Kaouk JH**: series single-port robotic procedures (1 RP, 1 Py, 1 RN)
  
  *Kaouk JH et al BJU 2008;103:366-369*

- **Joseph RA**: “chopstick” surgery enabling the use of current da Vinci robotic arms through a single incision without collision

  *Joseph RA et al Surg Endo 2010; 24:1331-1335*
daVinci single site surgery: “chopstick surgery”

- Using *da Vinci Si* System with 8.5mm 3D HD endoscope
- Curved-instrument cannulae
- 5mm, non-wristed, semi-rigid instruments

*da Vinci Single Site prototype*

Instruments and accessories shown have *not* been approved by the FDA.
A novel robotic instrumentation for laparoendoscopic single-site surgery (VeSPA, Intuitive Surgical, Sunnyvale, CA, USA).
Single Port

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

Flexible Systems
Conclusions: NOTES is still an investigational approach in urology. LESS has proven to be immediately applicable in the clinical field, being safe and feasible in the hands of experienced laparoscopic surgeons. Development of instrumentation and application of robotic technology are expected to define the actual role of these techniques in minimally invasive urologic surgery.
daVinci Skills Simulator
daVinci Skills Simulator

- Portable case integrates with a SI or SI-e console
- Novel practice platform
- Increases familiarity with the da Vinci system; shortens learning curve
- Many learning opportunities
- Measures progress
- Warm-up before surgery
Exercises available:

- EndoWrist manipulation
- Camera and clutching
- Fourth arm integration
- System setting
- Needle control and diving
- Energy and dissection
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