da Vinci™ Prostatectomy

USMD Prostate Cancer Center (www.usmdpcc.com)
Prostate Cancer Facts

- Prostate cancer
  - Leading type of cancer in men in U.S.
  - Second leading cause of cancer deaths in American males.
  - ~200,000 diagnosed in 2009.
  - About 30,000 deaths in 2008 in U.S.
  - Improved outcomes with more experience and with higher surgeon volumes
Staging of Prostate Cancer

- Nomographic data (stage, PSA, Gleason sum)
- PSA
- Digital Rectal Exam
- Trans Rectal Ultrasound
- Gleason Score (2-10)
- Bone Scan
- +/- CT scan or MRI
- Staging biopsies (seminal vesicle invasion)
- Biopsy and TNM staging system
  - Tumor, Nodes, Metastases
Prostate Cancer T1 disease

**STAGE I**

- Cannot be felt
- **T1a** - cancer found in ≤ 5% TURP specimen
- **T1b** - cancer found in ≥ 5% TURP specimen
- **T1c** - cancer found as a result of PSA elevation only
Prostate Cancer T2

**STAGE II**

- Can be felt during DRE (digital rectal exam)
- T2a - felt on one side of prostate
- T2b - felt on both sides of prostate

- Tumor not detectable by imaging or clinical exam
  - May be found in one or more lobes by needle biopsy
- Moderate/high grade tumor
- More than 5% of tissue specimen
Prostate Cancer T3

- Has spread beyond the prostate
- T3a - extra capsular extension
- T3b - tumor invades seminal vesicle(s)
Cancer has invaded local organs
- Bladder invasion
- Invasion into surrounding pelvic side wall
- May cause pain in joints and back

Tumor is fixed or invades adjacent structures other than seminal vesicles
- Neck of bladder, external sphincter, rectum, muscles, pelvic wall

Any grade tumor
Treatment Options (Clinically Localized Cancer)

- External Beam Radiation Therapy
- Brachytherapy (Radioactive seeds)
- Cryosurgery (Freezing prostate)
- Observation/Watchful waiting
- Surgery (Radical Prostatectomy)
  - Open Surgery
  - Conventional Laparoscopic Surgery
  - *da Vinci™* Prostatectomy (Robotic-Assisted Surgery)
Goals of Radical Prostatectomy

- Remove the prostate and cancer
- More precise staging (Path report and PLND)
- Achieve high cure rates
- Preserve urinary function
- Preserve erectile function

Pathologic analysis of the prostate and lymph nodes after surgery to:
- 1. Assess risk of recurrence of cancer
- 2. Determine if further treatment is needed (Multimodal therapy)
Evolution of Robotic Prostate Surgery

- **Localized Prostate Cancer Synopsis**
  - Open Prostatectomy is Gold Standard therapy of prostate CA
    - First robotic prostatectomy in US 2001
    - AUA message in 2004-05 “...results with laparoscopic and robotic prostatectomy show promise once experience is achieved. However, robotic prostatectomy continues to be plagued by higher positive surgical margin rates and expenses which ultimately limit its application.”
    - They also added “Early on, there is a higher complication rate with laparoscopic and robotic approaches compared with the open approach.”
    - More recent data with robotic prostatectomy shows equivalent cancer outcomes and less complications

- Henry Ford and Case Western - 200 consecutive robotic cases and 100 consecutive RRP cases
- Robotic cases by a single surgeon and open cases by 8 surgeons with a combined 1400 case experience

<table>
<thead>
<tr>
<th>Parameter</th>
<th>RRP v Robot</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood loss</td>
<td>910 v 150</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Transfusion</td>
<td>11% v none</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Complications</td>
<td>20% v 5%</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Hgb @ discharge</td>
<td>10 v 13</td>
<td>&lt;0.005</td>
</tr>
<tr>
<td>Hospital stay</td>
<td>3.5 v 1.2 days</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Positive Margin Rate</td>
<td>23% v 9%</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>

“At one year continence was achieved in 72% of the open and 92% of the robotic group, while erections were reported by 32% of the open and 80% of the robotic group.”
Comparing Techniques

- World J Urol; Drouin SJ, 2009 Oct;27(5) “Comparison of mid-term carcinologic control obtained after open, laparoscopic and robot assisted radical prostatectomy... data from 2000-2004

- **Patients**  
  - 83 open
  - 85 lap
  - 71 robot

- **Transfusion**  
  - 9.6%
  - 5.9%
  - 5.6%

- **Positive Margin**  
  - 18.1%
  - 18.8%
  - 16.9%

- **5 yr psa free**  
  - 87.8%
  - 88.1%
  - 89.6%

- Author’s conclusions: Although open radical prostatectomy remains gold standard, we found no difference between these 3 techniques regarding early oncologic outcomes.

- So robotic surgeons kept treating...
Larger Robotic Prostatectomy Series Outcomes

- 1500 cases by single surgeon; intraoperative and post operative data
- Mean OR time (skin to closure) 105 m/1hr 45 m (55-300)
- EBL was 111cc (50-500); Transfusion rate of 0.48%
- 97% of pts discharged home post op day 1
- Overall complication rate 4.3% with no mortalities
- Positive margin rate overall 9.3%; PMR with pT2 4%

- Conclusions: largest published robotic series at the time...Our data demonstrates the feasibility, safety and efficacy of the procedure.
What can the robot do to help the surgeon?

- Laparoscopic surgery allows intra-abdominal pressure therefore compression of vessels and less blood loss and cleaner operative field
- 10 times normal magnification with 1080 HD vision and in 3D. Allows us to see all structures and anatomy much better
- Ability to close anastomosis with a running versus interrupted suturing
- More precise movement of instruments (no tremor and variable ratio movement 1:2 - 1:5)
- Everything done under direct vision versus “by feel”
What is the *da Vinci*® Surgical System?

- Master/Slave - no movements performed w/o surgeon’s control
- Surgeon is immersed in 3-Dimensional image of the surgical field - Depth perception not found in typical laparoscopy
- Assistant surgeon is at patient’s side
The Surgeon Directs The Instruments

- The surgeon’s hands operate the masters and his feet control the pedals allowing total control of the robot
- **Masters** - control all instruments and drive camera
- **Foot Pedals** - allow surgeon to switch instruments, use monopolar and bipolar cautery and focus camera

www.uant.com
Traditional laparoscopic instruments are rigid and don’t bend

*EndoWrist®* Instruments move like a human wrist
- Same degrees of freedom as the human hand
- Makes laparoscopic knot tying simple
  - Anastomosis (1 hr v 15m)
Benefits of Robotic Prostatectomy

- Decreased blood loss
- Shortened length of hospital stay
- Decreased postoperative pain
- Less scarring
- Shorter urinary catheter time
- Faster return to regular activities
- Better visualization of bladder neck and neurovascular bundles to facilitate improved potency and continence
Robotic-Assisted Surgery Access

Open Surgical Incision

*da Vinci*™ Prostatectomy Incision
Traditional Open Surgery and Robotic Prostatectomy

- **Open Procedure**
  - Long Incision
  - Hospital Stay of 2-4 days
  - Blood Loss 1000ml with a significant transfusion rate (3-20% in Urol. Lit.)
  - Catheter removal 14 days
  - Full activity 6 weeks or longer

- **Robotic-Assisted Procedure (da Vinci)**
  - 5-6 small keyhole incisions
  - Hospital stay of 1 day
  - Blood Loss 250 ml; significantly less transfusions
  - Catheter removal 7 days
  - Shorter Recovery Time with Full activity in 3-4 weeks
  - Less pain and less narcotic use post op
  - Fewer surgical infections (5.4% open vs 0.9% robotic)
  - Fewer bladder neck contractures (4-5% open vs <1% robotic)
    - Requires additional surgery and leads to prolonged incontinence
## Bilateral Nerve Sparing Results

<table>
<thead>
<tr>
<th>Author</th>
<th>Capable of Intercourse</th>
</tr>
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<tbody>
<tr>
<td>Walsh</td>
<td>86%</td>
</tr>
<tr>
<td>Catalona</td>
<td>68%</td>
</tr>
<tr>
<td>Scardino</td>
<td>76%</td>
</tr>
<tr>
<td>Guillonneau</td>
<td>66%</td>
</tr>
<tr>
<td>Abbou</td>
<td>54%</td>
</tr>
<tr>
<td>Turk</td>
<td>59%</td>
</tr>
<tr>
<td>Menon</td>
<td>90%</td>
</tr>
<tr>
<td>Ahlering</td>
<td>80%</td>
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</table>

Source: Published Clinical Data

www.uant.com
## Continence Overview

<table>
<thead>
<tr>
<th>Surgeon</th>
<th>3 mo</th>
<th>6 mo</th>
<th>12 mo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catalonia</td>
<td>N/A</td>
<td>N/A</td>
<td>92% 18 months</td>
</tr>
<tr>
<td>Walsh</td>
<td>54%</td>
<td>80%</td>
<td>93% 18 months</td>
</tr>
<tr>
<td>Abbou</td>
<td>58%</td>
<td>69%</td>
<td>78.4%</td>
</tr>
<tr>
<td>Guillonneau</td>
<td>N/A</td>
<td>N/A</td>
<td>85.5%</td>
</tr>
<tr>
<td>Rassweiler</td>
<td>54%</td>
<td>74%</td>
<td>97%</td>
</tr>
<tr>
<td>Menon</td>
<td>N/A</td>
<td>N/A</td>
<td>96%</td>
</tr>
<tr>
<td>Ahlering</td>
<td>76%</td>
<td>91%</td>
<td>94%</td>
</tr>
<tr>
<td>Patel</td>
<td>78%</td>
<td>89%</td>
<td>98%</td>
</tr>
</tbody>
</table>

Source: Published Clinical Data
# Positive Margin Results

<table>
<thead>
<tr>
<th>Series</th>
<th>% Positive margins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walsh/J. Hopkins</td>
<td>pT/pT2 / 14.7%, 8%</td>
</tr>
<tr>
<td>Scardino</td>
<td>12.9%, 6.8%</td>
</tr>
<tr>
<td>Soloway (Review of several centers)</td>
<td>28 %</td>
</tr>
<tr>
<td>Lepor</td>
<td>26 %</td>
</tr>
<tr>
<td>Guillonneau</td>
<td>13.7%</td>
</tr>
<tr>
<td>Abbou</td>
<td>20%</td>
</tr>
<tr>
<td>Turk</td>
<td>26%</td>
</tr>
<tr>
<td>Sulser</td>
<td>18%</td>
</tr>
<tr>
<td>Menon</td>
<td>17%, 6%</td>
</tr>
<tr>
<td>Ahlering</td>
<td>17%</td>
</tr>
<tr>
<td>Patel (largest series)</td>
<td>9.3%, 4%</td>
</tr>
</tbody>
</table>

Source: Published Clinical Data
Patient Positioning
Robotic Hands
Placing Robotic Ports

Port Placement1.mpg
Connecting Robotic Arms

Connecting Robot1.mpg
Surgical Console

Console1.mpg
Anterior Dissection:
Dropping Bladder and Enter Space of Retzius
Endopelvic Fascia and Ligation of the Dorsal Venous Complex
Neurovascular Bundle Dissection
Apical Urethra Dissection
Bladder Neck/Urethra Anastomosis
Thanks!

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