ROBOTIC UROLOGIC SURGERY

Robert I. Carey MD PhD

Urology Treatment Center
Florida State University School of Medicine
Sarasota Memorial Hospital
State of the Art Robotic Surgery

Topics for prostate cancer:
PSA screening
Diet and prevention

The “trifecta” for prostate cancer treatment:
Cancer cure
Continence
Preservation of potency
Robert I. Carey, MD PhD
Direct, real-time temperature monitoring during radiofrequency and microwave ablation of renal tumors greater than 3 cm

Robert I. Carey MD PhD
Urology Treatment Center
Sarasota Memorial Hospital
Florida State University
School of Medicine

Raymond J. Leveillee MD
Department of Urology
University of Miami
Miller School of Medicine
An inspiring physical, emotional, and spiritual guide for prostate cancer patients, survivors, and their loved ones

Conquer Prostate Cancer empowers patients to face diagnosis with dignity, explore their options realistically, and tackle recovery with optimism and determination.

The first book to emphasize robotic surgery for prostate cancer from an informed layman’s perspective, Conquer Prostate Cancer discusses the latest research and advances in treatment, and profiles twenty patients who chose various treatment options.

As the author and his wife share the most intimate details of their prostate cancer journey, you’ll learn how to:

- Become an active member of your medical team
- Reduce pain and stress and renew your vitality
- Overcome impotence and incontinence
- Enhance your intimate relationships
- Draw strength from your faith, family, and friends

With its low-keyed humor, positive and hopeful tone, and well-researched facts, this book is a powerful tool for surviving prostate cancer.

“Rabbi Weinberg draws on his own medical ordeal to bring guidance and comfort to others.”
—Rabbi Harold Kushner, author of When Bad Things Happen to Good People

“Experience the joys of sex again...brilliant, inspiring, and gutsy.”
—Dr. Ellen Kreidman, psychologist and relationship expert appearing on Oprah, The Today Show and The View, featured in The New York Times

“I applaud the author for recognizing that women, in their own way, get prostate cancer too.”
—Leah Cohen, prostate cancer survivor’s wife and prostate cancer blog editor

Edgar Weinberg is a prostate cancer survivor and rabbi with a doctorate in gerontology from Columbia University. Robert Carey, M.D., is a prominent urologist and robotic surgeon with a Ph.D. from MIT. David Kauder, M.D., the book’s medical advisor, has been a urologist for 50 years and is a former president of the Massachusetts Association of Practicing Urologists.
2008 Chinese Medical Society, Shanghai
2008 Royal College of Surgeons Ireland – Irish Society of Urology
2008 World Urology Robotic Surgery Symposium
2006 World Congress of Endourology – First Prize Lecture
2006 American College of Surgeons
2006 American Urological Association
Prostate Cancer

“Conquer Prostate Cancer”
by Rabbi Ed Weinsberg and Robert I. Carey
J. Robotic Surgery Editorial Staff
Publications and Presentations

Kidney Cancer
First prize lecture and publication for the nephron-sparing surgery using ablation technology

Urothelial Cancer
Patent for Drug delivery to treat urothelial cancer in the Upper Urinary Tract
Review article “Upper tract urothelial carcinoma”
Journal of Expert Reviews in Anti-cancer therapy
Evolution of Robotic Technology

- AESOP
- Zeus
- da Vinci
  (Intuitive Surgical)
- Original concept
  (military purposes)
da Vinci S Surgical System

- da Vinci® system (Intuitive Surgical)
  - Computer integration
  - Intra-abdominal articulation of the microinstruments
  - True 3D binocular vision
  - Remotely controlled robotic arms on surgical cart
  - Magnification, tremor filtration, motion scaling
Console

Surgeon Console

• Hand to eye alignment
• Natural intuitive movements
• Ergonomic surgeon position
• Navigator™ camera control
InSite™ 3-D Vision System

- Superior 3-D image
- Stereoscopic design with two 3-chip cameras
- 75% better resolution than any imaging system
Advantages of the daVinci Robot

- Stereoscopic 3-D vision
- Robotic wrist
- Six degrees of freedom
- Tremor filtering
- Movement scaling
Robotic Utilization

- **Cardiac Surgery**
  - Atrial septal defect closure
  - Totally endoscopic coronary bypass
  - Mitral valve repair
  - Internal thoracic artery take-down
  - LV bipolar pacing lead placement
  - Patent ductus arteriosus closure

- **Thoracic Surgery**
  - Esophagectomy
  - Heller myotomy
  - Pulmonary resection

- **Urologic Surgery**
  - Prostatectomy
  - Cystopexy
  - Pyeloplasty
  - Ureteral Reimplantation

- **General Surgery**
  - Cholecystectomy
  - Nissen fundoplication
  - Gastric bypass
  - Colectomy
  - Adrenalectomy
  - Splenectomy
  - Gastrectomy
  - Donor nephrectomy

- **Gynecologic Surgery**
  - Salpingectomy
  - Oophorectomy
  - Tubal reanastomoses
  - Hysterectomy
  - Myomectomy
Urologic Robotic Procedures

- Radical prostatectomy
- Pyeloplasty
- Psoas hitch, Boari flap
- Ureteral reimplantation
- Bladder diverticulectomy
- Cystectomy, neobladder
- Renal transplantation
- Adrenalectomy
- Nephrectomy
Urethral Length
Cosmesis and Recovery

Open Prostatectomy Incision  Robotic Prostatectomy Incisions
Diagnosis of Prostate Cancer

♦ PSA
  – Absolute value
  – Velocity
  – Total/Free (ratio)

♦ TRUS Biopsy
  – Gleason grade
  – Clinical Stage
  – Prostate size

♦ Staging
  – Digital Rectal Exam
  – Bone Scan, MRI, CT

♦ Performance Status
  – Medical Comorbidities
  – Previous surgery
  – LUTS
  – Erectile function
Gleason grade 1
Gleason grade 2
Gleason grade 3
Gleason grade 4
Gleason grade 5
Multimodality
Treatment Options

(MSG Watchful Waiting)
- Comparisons head to head with surgery in RCT

(MSG Radiation Therapy)
- Technique du jour
- Brachy, HDR, IMRT
- Cyberknife
- Proton Beam

(MSG Ablation Therapy)
- Cryotherapy
- 3D-Mapping

(MSG Androgen Deprivation)
- Neoadjuvant for radiation therapy

(MSG Radical Prostatectomy)
- Robotic vs Open
Honesty and Integrity in Staging

What is the test really observing?

What are the limits of detection?

What is the validation?

Does the test help you make a decision (is the test clinically relevant)?

Are you being overstaged?
Will these tests be useful to me?

Nuclear Medicine Bone Scan?

Computed Tomography (CT) Scan?

Magnetic Resonance Imaging (MRI) Scan?

Color Doppler Flow Ultrasound?

Are you being overstaged?
The number of cases of prostate cancer per year is large

230,000 new cases (2005)
30,350 deaths (2005)

1 man in 6 (16.7%) lifetime risk of diagnosis of prostate cancer in US

1 man in 33 (3%) chance of death by prostate cancer

American Cancer Society: Facts and figures
# 2005 Estimated US Cancer Cases*

<table>
<thead>
<tr>
<th>Cancer Type</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prostate</td>
<td>33%</td>
<td></td>
</tr>
<tr>
<td>Lung and bronchus</td>
<td>13%</td>
<td></td>
</tr>
<tr>
<td>Colon and rectum</td>
<td>10%</td>
<td></td>
</tr>
<tr>
<td>Urinary bladder</td>
<td>7%</td>
<td></td>
</tr>
<tr>
<td>Melanoma of skin</td>
<td>5%</td>
<td></td>
</tr>
<tr>
<td>Non-Hodgkin lymphoma</td>
<td>4%</td>
<td></td>
</tr>
<tr>
<td>Kidney</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>Leukemia</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>Oral Cavity</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>Pancreas</td>
<td>2%</td>
<td></td>
</tr>
<tr>
<td>All Other Sites</td>
<td>17%</td>
<td></td>
</tr>
</tbody>
</table>

- Prostate: 33% 
- Lung and bronchus: 13% 
- Colon and rectum: 10% 
- Urinary bladder: 7% 
- Melanoma of skin: 5% 
- Non-Hodgkin lymphoma: 4% 
- Kidney: 3% 
- Leukemia: 3% 
- Oral Cavity: 3% 
- Pancreas: 2% 
- All Other Sites: 17%

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2005 Estimated US Cancer Deaths*

<table>
<thead>
<tr>
<th>Cancer Site</th>
<th>Men 295,280</th>
<th>Women 275,000</th>
</tr>
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<tbody>
<tr>
<td>Lung and bronchus</td>
<td>31%</td>
<td>27% Lung and bronchus</td>
</tr>
<tr>
<td>Prostate</td>
<td>10%</td>
<td>15% Breast</td>
</tr>
<tr>
<td>Colon and rectum</td>
<td>10%</td>
<td>10% Colon and rectum</td>
</tr>
<tr>
<td>Pancreas</td>
<td>5%</td>
<td>6% Ovary</td>
</tr>
<tr>
<td>Leukemia</td>
<td>4%</td>
<td>6% Pancreas</td>
</tr>
<tr>
<td>Esophagus</td>
<td>4%</td>
<td>4% Leukemia</td>
</tr>
<tr>
<td>Liver and intrahepatic bile duct</td>
<td>3%</td>
<td>3% Non-Hodgkin lymphoma</td>
</tr>
<tr>
<td>Non-Hodgkin Lymphoma</td>
<td>3%</td>
<td>3% Uterine corpus</td>
</tr>
<tr>
<td>Urinary bladder</td>
<td>3%</td>
<td>2% Multiple myeloma</td>
</tr>
<tr>
<td>Kidney</td>
<td>3%</td>
<td>2% Brain/ONS</td>
</tr>
<tr>
<td>All other sites</td>
<td>24%</td>
<td>22% All other sites</td>
</tr>
</tbody>
</table>

ONS=Other nervous system.
Source: American Cancer Society, 2005.

Rate Per 100,000

*Age-adjusted to the 2000 US standard population.
# Lifetime Probability of Developing Cancer, By Site, Men, US, 1999-2001

<table>
<thead>
<tr>
<th>Site</th>
<th>Risk</th>
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<tbody>
<tr>
<td>All sites</td>
<td>1 in 2</td>
</tr>
<tr>
<td><strong>Prostate</strong></td>
<td>1 in 6</td>
</tr>
<tr>
<td>Lung and bronchus</td>
<td>1 in 13</td>
</tr>
<tr>
<td>Colon and rectum</td>
<td>1 in 17</td>
</tr>
<tr>
<td>Urinary bladder</td>
<td>1 in 28</td>
</tr>
<tr>
<td>Non-Hodgkin lymphoma</td>
<td>1 in 46</td>
</tr>
<tr>
<td>Melanoma</td>
<td>1 in 53</td>
</tr>
<tr>
<td>Kidney</td>
<td>1 in 67</td>
</tr>
<tr>
<td>Leukemia</td>
<td>1 in 68</td>
</tr>
<tr>
<td>Oral Cavity</td>
<td>1 in 73</td>
</tr>
<tr>
<td>Stomach</td>
<td>1 in 81</td>
</tr>
</tbody>
</table>

Men diagnosed with prostate cancer

99% survive at least 5 years
92% survive at least 10 years
61% survive at least 15 years.

These figures include all stages and grades of prostate cancer but do not account for men who die from other causes.
About **86% of all prostate cancers** are found in the local and regional stages (no spread to distant organs).

The **5-year relative survival rate** for all of these men is nearly 100%.

Of the men whose prostate cancers have already spread to distant parts of the body at the time of diagnosis, about **34% will survive at least 5 years.**
Become Well Informed Prior to Making Treatment Decisions

Establish trust between provider and patient

Understand the expected follow-up after treatment

Understand the risks/benefits/side effects associated with treatment options

Low grade, Low stage Prostate Cancer is not an emergency. Take the time you need.
Honesty and Integrity in Staging

What is the test really observing?

What are the limits of detection?

What is the validation?

Does the test help you make a decision (is the test clinically relevant)?

Are you being overstaged?
Robotic Radical Prostatectomy

Advantages

Less pain
Decreased hospital stay (<24 hrs)
Lower blood loss (<100 cc)
Early catheter removal
Early continence
Consistently achieved nerve sparing
Robotic Procedures by Dr. Carey at Sarasota Memorial

- 330 cases. Robotic-assisted laparoscopic radical prostatectomy (27 different states and Canada)

- 155 cases. Laparoscopic or robotic kidney cancer cases

- 12 cases. Robotic-assisted bladder diverticulectomy, ureteral reimplant, pyeloplasty, and partial cystectomy
♦ **RALRP** – **n = 330 cases**

- Mean Age 63.3 (46-79)
- BMI 28.18 (20.9 – 43.9)
- Mean serum PSA 6.0 (0.77 – 26.1)
- Mean prostate Weight 55.1 (22 – 131 grams)
- 87 % Either T2c or greater or PSA = 10 or greater
<table>
<thead>
<tr>
<th>Clinical Stage</th>
<th></th>
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<tbody>
<tr>
<td>T1c</td>
<td>1.5%</td>
</tr>
<tr>
<td>T2a</td>
<td>17%</td>
</tr>
<tr>
<td>T2b</td>
<td>4.5%</td>
</tr>
<tr>
<td>T2c</td>
<td>60%</td>
</tr>
<tr>
<td>T3a</td>
<td>9%</td>
</tr>
<tr>
<td>T3b</td>
<td>5%</td>
</tr>
<tr>
<td>Lymph node positive</td>
<td>3%</td>
</tr>
</tbody>
</table>
Carey 2009

87% of patients are high risk

PSA > 10

T2c or higher stage

Gleason score 7 or higher

The 13% lower risk patients?

urinary retention, LUTS,
very large prostates (>100 grams)
BMI 20 - BMI 44

The robot does not discriminate

Obese patients are much more suitable for robotic prostatectomy than for open procedures
Trocar Placement

- Camera port (12-mm)
- da Vinci ports (8-mm)
- Assistant ports (12mm)
- Assistant ports (5mm)
300 + pounds – the da Vinci system does not discriminate
Cancer cure –
  Positive margins
  PSA recurrence
  Adjuvant therapy

Continence –
  Immediate, Early, Delayed
  Details of surgery: technique matters

Coitus -
  Preservation of potency
  Cautery free nerve sparing procedure
  Precise dissection with no thermal gadgetry
<table>
<thead>
<tr>
<th>Surgeon</th>
<th>% pos</th>
<th>Tech</th>
<th>#cases</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walsh</td>
<td>1.8%</td>
<td>Open</td>
<td></td>
<td>J. Urol (2007)</td>
</tr>
<tr>
<td>Soloway</td>
<td>29%</td>
<td>Open</td>
<td>800</td>
<td>J. Urol (2002)</td>
</tr>
<tr>
<td>Scardino</td>
<td>28%</td>
<td>Open</td>
<td>478</td>
<td>Eur Urol (2007)</td>
</tr>
<tr>
<td>Patel</td>
<td>9.3%</td>
<td>Robotic</td>
<td>1500</td>
<td>J. Endourol (2008)</td>
</tr>
<tr>
<td>Menon</td>
<td>13%</td>
<td>Robotic</td>
<td>2652</td>
<td>Eur Urol (2007)</td>
</tr>
<tr>
<td>Carey</td>
<td>12%</td>
<td>Robotic</td>
<td>330</td>
<td>WRUS 2009</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(5.7% after 150 cases done at new hospital)</td>
</tr>
</tbody>
</table>
Carey 2009

87% high risk patients
5.7% positive surgical margins over last 180 cases

PSA > 10
T2c or higher stage
Gleason score 7 or higher

Why are the surgical margins rates better?
Anatomically precise dissection
Extended, high quality lymph node dissection
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Immediate</td>
<td>33%</td>
</tr>
<tr>
<td>1 month</td>
<td>64%</td>
</tr>
<tr>
<td>3 month</td>
<td>95%</td>
</tr>
<tr>
<td>6 month</td>
<td>96%</td>
</tr>
<tr>
<td>9 month</td>
<td>97%</td>
</tr>
<tr>
<td>12 month</td>
<td>98%</td>
</tr>
<tr>
<td>AUS</td>
<td>0%</td>
</tr>
</tbody>
</table>

Continence Center at SMH closed within one year of my arrival at SMH.
Anterior urethral tissue supported to the periosteum of the pubic arch
Anterior urethral tissue supported to the periosteum of the pubic arch
Dissection to achieve the maximum urethral length: preservation of external sphincter with negative apex margin
Dissection of urethra
Dissection of urethra
Dissection of urethra
Anastomosis of bladder neck to urethra
Preservation of Potency

Cautery-free neurovascular bundle sparing procedure

Use no thermal gadgetry near NVB’s

Hemo-lock clips on the vascular pedicles

Cautery-free separation of prostatic fascia containing the NVB’s from prostatic capsule with no capsular incisions
Retrograde Cautery Free Nerve Sparing RALRP:
Techniques & Demonstration
Salvage Therapy

61 year old male 2 years after HIFU therapy
Salvage Therapy

63 year old male 1 year after IMRT therapy
“All those in favour of accepting more robots?”
<table>
<thead>
<tr>
<th>Economic Comparison - Health Care Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Robotic Surgery</strong></td>
</tr>
<tr>
<td>$1800 surgeon fee</td>
</tr>
<tr>
<td>$9000 facility DRG</td>
</tr>
<tr>
<td><strong>Cost of Robot</strong></td>
</tr>
<tr>
<td>$1.5 million</td>
</tr>
<tr>
<td><strong>Low cost follow up</strong></td>
</tr>
<tr>
<td>PSA</td>
</tr>
</tbody>
</table>
Diet

No Level 1 evidence for prevention or treatment of prostate cancer with diet

Recommend Heart Healthy diet
- avoid high glycemic index foods
- avoid trans fats and decrease obesity
- Include tomato sauces and cruciferous vegetables

Failure of the Select Trial (Vit E and selenium)
AUA practice guidelines regarding PSA screening

www.auanet.org

Age for initial screening dropped to age 40

Use of DRE, free/total PSA, PSA velocity
Family history, ethnicity
Conclusions

Robotic-assisted laparoscopic surgery is mainstream for urologic oncologic and reconstructive surgery

Robotic-assistance makes surgeons better. Surgeons need to be trained in its use

Better outcomes for Quality of Life and Cancer Cure on a consistent basis across all body shapes and sizes.
Conclusions

Control healthcare costs through more judicious spending.

Wise use of technology saves money.

Healthcare professionals who have no financial or other considerations need to be involved in policy decisions.
THE GREAT DEBATE

OPEN VS ROBOTIC RADICAL PROSTATECTOMY
RALRP studies show reduced blood loss of 43-109 cc

Two prospective series comparing RRP and RALP:

- Farnham et al
  - 76 RALP and 103 RRP patients
  - Discharge HCT was significantly better in RALP patients (36.8 vs 32.8)

- Tewari et al
  - 200 RALP and 100 RRP
  - Discharge HGB was significantly better in RALP patients (13.0 vs 10.1)
Cautery-free neurovascular bundle sparing procedure

Use no thermal gadgetry near NVB’s

Hemo-lock clips on the vascular pedicles
  (or Bulldog clamp and suture ligature)

Cautery-free dissection of NVB from prostate

Improved early return to potency (3 months)
Robotic vs. Open

- Ahlering et al. UC Irvine
- Urology: 63:2004
- Robotic experience of an open surgeon

<table>
<thead>
<tr>
<th>PARAMETERS</th>
<th>OPEN</th>
<th>ROBOTIC</th>
</tr>
</thead>
<tbody>
<tr>
<td># PATIENTS</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>OR TIME (min)</td>
<td>214</td>
<td>231</td>
</tr>
<tr>
<td>EBL (cc)</td>
<td>418</td>
<td>103</td>
</tr>
<tr>
<td>LOS (hrs)</td>
<td>52</td>
<td>25</td>
</tr>
<tr>
<td>COMPLICATIONS %</td>
<td>20</td>
<td>4</td>
</tr>
<tr>
<td>CATHETER (days)</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>MARGIN + RATE</td>
<td>12</td>
<td>10</td>
</tr>
</tbody>
</table>
Conclusions: Ahlering et al.

- Fewer positive margins in high risk patients with high Gleason score or increased volume
- pT2: + margin rate: 4.6%
- More precise dissection
- Benefits of laparoscopy without compromising functional or oncological results
Robotic vs Open

- Tewari et al. Henry Ford
- British Journal of Urology:92:2003

<table>
<thead>
<tr>
<th>PARAMETERS</th>
<th>OPEN</th>
<th>ROBOTIC</th>
</tr>
</thead>
<tbody>
<tr>
<td># PATIENTS</td>
<td>100</td>
<td>200</td>
</tr>
<tr>
<td>OR TIME (min)</td>
<td>163</td>
<td>160</td>
</tr>
<tr>
<td>EBL (cc)</td>
<td>910</td>
<td>153</td>
</tr>
<tr>
<td>LOS (hrs)</td>
<td>3.5</td>
<td>1.2</td>
</tr>
<tr>
<td>COMPLICATIONS %</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>CATHETER (days)</td>
<td>15</td>
<td>7</td>
</tr>
<tr>
<td>MARGIN + RATE</td>
<td>23</td>
<td>9</td>
</tr>
</tbody>
</table>
Conclusions: Tewari et al.

- No transfusions
- Less pain
- Faster recovery
- Lower margin + rate
- Faster continence
  - 44 vs 160 days
- Earlier return of potency
  - 180 vs 440 days
Open vs. Lap vs. Robotic

Menon et al. Henry Ford

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>OPEN</th>
<th>LAP</th>
<th>ROBOTIC</th>
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<tbody>
<tr>
<td># PATIENTS</td>
<td>100</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>OR TIME (min)</td>
<td>164</td>
<td>248</td>
<td>140</td>
</tr>
<tr>
<td>EBL (cc)</td>
<td>900</td>
<td>380</td>
<td>&lt;100</td>
</tr>
<tr>
<td>POS MARGINS (%)</td>
<td>24</td>
<td>24</td>
<td>5</td>
</tr>
<tr>
<td>COMPLICATIONS %</td>
<td>15</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>CATHETERER (days)</td>
<td>15</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>LOS (days)</td>
<td>3.5</td>
<td>1.3</td>
<td>1.2</td>
</tr>
</tbody>
</table>
Thank You