Minimally Invasive Surgical Treatment of Prostate Cancer: Robots, Microwaves, and Freezers

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Disclosures

• Relevant
  – EDAP HIFU - investigator
  – Intuitive surgical – proctor
  – SWOG - investigator/member

• Probably not relevant
  – Sanofi-Aventis – DVT prophylaxis
  – Aeterna-Zentaris – BPH
  – Applied medical – proctor
Goals

• Review history of robotic surgery and current version
• Highlight the advantages and controversies of robotic surgery for prostate cancer
• Briefly describe high-intensity focused ultrasound
MIS for prostate cancer

- Robotic/laparoscopic radical prostatectomy
- High-intensity focused ultrasound
- Cryoablation
- Brachytherapy
- Targeted therapies
  - Cryo
  - HIFU
MIS for prostate cancer

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  - HIFU
Brief history of robotic surgery

• “robot” coined by Karel Capek in 1921 from Czech word robota meaning forced labor
• 1985 – PUMA 560 used for brain biopsy
• 1987 – first robotic gall bladder removal
• 1988 – PROBOT for TURP
• Late 1980s – ROBODOC first FDA approved for hip surgery
• Early 1990s – NASA and US Army developed systems
Brief history of robotic surgery

• 1993 – AESOP approved for surgery
• 1997 – daVinci begins use
• 1998 – ZEUS first fully robotic surgery (Computer Motion)
• 2000 – daVinci approved by FDA (Intuitive Surgical, Inc)
• 2003 – Computer Motion merged with Intuitive Surgical, Inc.
Laparoscopic radical prostatectomy?

• First lap RP in early 1990s – Schuessler et al Urol 1992
• Steep learning curve
• Lots of interest, but few able to do
• Easier to learn → Flourished
Robotic radical prostatectomy

Two important capabilities:
1. 3-D view
2. Wrist-like maneuvering
Trends in use
“daVinci prostatectomy”

“Investor presentation” - Intuitive Surgical website 2008
What is the problem?

150,000 websites
What is the problem?
Robotic Prostatectomy

- Same surgical goals – same surgery
- Demonstrated improvements
  - Blood loss during surgery (Farnham Urology 2006)
  - Cosmetic appearance
- Improved, but controversial
  - Post-operative recovery (Wood Urol 2007, Miller J Urol 2007)
  - Post-operative pain (Webster J Urol 2005)
Better clinical outcomes!!!
Reality or marketing hype?

“There are three kinds of lies: lies, damn lies, and statistics.”
- Benjamin Disraeli
Continence and Potency
“...lies, damned lies...”

- Urinary control
  - Appears equivalent with either technique (Patel Int J Clin Pract 2007)

- Preservation of erectile function
  - Appears equivalent with either technique (Patel Int J Clin Pract 2007)

- If there is a difference (and there may be), it is a small difference, that is <5%. (Michael Koch, personal communication)
Robotic Prostatectomy

- Appear equivalent
  - Preservation of erectile function
  - Maintenance of continence
- Cancer control (the most important issue)

Let’s see...
Cancer Control

• Clinical Outcome
  – Do more patients have cancer return in some meaningful way?
  – Requires decades
  – May never know the answer
Cancer Control

• PSA recurrence
  – Requires less time (5-10 years)
  – Preliminary results promising, but still not mature (median f/u largest series 22 months – Bandani et al. Cancer 2007)
Cancer Control

• “Cancer at the edge” (Positive margin) rates
  – Known soon after surgery
  – Seems to make a difference long-term
  – The same for cancer contained within the prostate gland. (2.5 – 36%) (Loeb Urol Oncol 2007, Patel BJU Intl 2007)
  – Appears to be the same in patients with cancer invading through the capsule (23-60%)
    • Open - Patrick Walsh 23% (Han J Urol 2004)
    • Robotic - Vipul Patel 23% (Patel BJU Intl 2007)
If equivalent, why robotic?

• Equipment costs will come down
• Costs of hospitalization will increase
  – Potentially an outpatient procedure
• Probably shortens the learning curve for “high-volume surgeons”
• Probably improves open technique
• High potential for innovation
Unanticipated benefit…

- Many publications show better outcomes with more experience. (Vickers JNCI 2007)

More radical prostatectomy/fewer urologists doing the procedure = more experienced surgeons = better outcomes for patients
High-intensity focused ultrasound

Probe insertion

Intra-rectal positioning
High-intensity focused ultrasound

- Treatment area programming
- Firing phase

Coagulation necrosis
HIFU history

• Consistent use in Europe for about 15 years (14,000 patients treated)
• Outpatient procedure
• Available in Mexico and Canada ($$)
• Ongoing US trial for low-risk patients
  – Clinical results are being watched carefully
“If your life’s work can be accomplished in your lifetime, you’re not thinking big enough.”

- Wes Jackson