Role of Robotic Surgery in Endometrial Cancer: New Expensive Gadget or the Future?

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Disclosure

• I have nothing to disclose.
Questions

• Why do we use it?
• What’s the evidence for robotic staging in EMCA?
• Controversies
Introduction

• 600,000 hysterectomies each year in US
• 1 in 9 women will undergo hysterectomy in her lifetime
• Benign hysterectomy In US (2010)
  – Abdominal hyst  47.4%
  – Vaginal hyst  29.2%
  – L/S hyst  23.3%
da Vinci Robotic Surgical System
Endometrial CA Staging

- Pelvic washing
- Hysterectomy / BSO
- Pelvic lymphadectomy
- Para-aortic lymphadectomy (high-risk dz)
- Omentectomy (UPSC, CC)
- Laparotomy was standard of care until a few years ago.
# Summary of RCTs: Laparoscopy Better Than Open

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong># of cases</strong></td>
<td>61</td>
<td>52</td>
<td>78</td>
<td>122</td>
<td>279</td>
<td>332</td>
<td>2616</td>
</tr>
<tr>
<td><strong>Op time</strong></td>
<td>NO</td>
<td>SAME</td>
<td>NO</td>
<td>-</td>
<td>NO</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td><strong>EBL</strong></td>
<td>YES</td>
<td>-</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>-</td>
<td>YES</td>
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<tr>
<td><strong>LN counts</strong></td>
<td>SAME</td>
<td>SAME</td>
<td>SAME</td>
<td>SAME</td>
<td>-</td>
<td>-</td>
<td>SAME</td>
</tr>
<tr>
<td><strong>LOS</strong></td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
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<tr>
<td><strong>Complications</strong></td>
<td>-</td>
<td>-</td>
<td>YES</td>
<td>-</td>
<td>SAME</td>
<td>YES</td>
<td>YES</td>
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<tr>
<td><strong>QoL</strong></td>
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<td>-</td>
<td>YES</td>
<td>-</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
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<tr>
<td><strong>Cost-effective</strong></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>YES</td>
<td>-</td>
<td>-</td>
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<tr>
<td><strong>Survival</strong></td>
<td>-</td>
<td>-</td>
<td>SAME</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>SAME</td>
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## Endometrial CA Staging:Robotics

<table>
<thead>
<tr>
<th>Study Year</th>
<th>Arms</th>
<th>N</th>
<th>Op Time (mins)</th>
<th>EBL</th>
<th>Convert (%)</th>
<th>LOS (d)</th>
<th>Compli (%)</th>
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<tbody>
<tr>
<td>Lowe 2009</td>
<td>Robotic</td>
<td>405</td>
<td>170</td>
<td>87</td>
<td>6.7</td>
<td>1.8</td>
<td>18</td>
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<tr>
<td>Seamon 2009</td>
<td>Robotic L/S</td>
<td>105</td>
<td>242</td>
<td>100</td>
<td>12</td>
<td>1</td>
<td>13</td>
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<tr>
<td>Boggess 2008</td>
<td>Robotic L/S</td>
<td>103</td>
<td>191</td>
<td>74</td>
<td>2.9</td>
<td>1</td>
<td>5.8</td>
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<tr>
<td></td>
<td>Open</td>
<td>81</td>
<td>213</td>
<td>146</td>
<td>4.9</td>
<td>1.2</td>
<td>13.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>138</td>
<td>146</td>
<td>266</td>
<td>-</td>
<td>4.4</td>
<td>29.7</td>
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<tr>
<td>DeNardis 2008</td>
<td>Robotic</td>
<td>56</td>
<td>177</td>
<td>105</td>
<td>5.4</td>
<td>1</td>
<td>14.3</td>
</tr>
<tr>
<td></td>
<td>Open</td>
<td>106</td>
<td>79</td>
<td>241</td>
<td>-</td>
<td>3.2</td>
<td>36.8</td>
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<tr>
<td>Veljovich 2008</td>
<td>Robotic</td>
<td>25</td>
<td>283</td>
<td>67</td>
<td>2</td>
<td>1.7</td>
<td>8</td>
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<tr>
<td></td>
<td>Open</td>
<td>131</td>
<td>139</td>
<td>198</td>
<td>-</td>
<td>5.3</td>
<td>20.6</td>
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</table>
So Far…

• Robotic staging is safe, feasible, and achieves similar outcomes compared to L/S staging. Both are superior to open staging.

• Robotic staging has lower conversion rate.
That was then...
This is now...
Obesity – An epidemic
Robotics in Obese Patients
BMI = 62
GOG LAP2 Trial Conversion Rate

Walker J L et al. JCO 2009;27:5331-5336

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Robotics in Obese Patients
Anesthesia

- Challenges – even before pneumo or trendelenburg
  - 30% lower lung compliance
  - 68% higher inspiratory resistance

- Pneumoperitoneum
  - further decrease lung compliance
  - further increase inspiratory resistance

- Steep Trendelenburg

- Can’t move patient once robot is docked

- Arms tucked
  - limited access if additional IV needed

Sprung et al. Anesth Analg 2002
Robotics in Obese Patients
Anesthesia

• Intraop maneuvers to manage ventilation
  – Propping in “ramp” position
  – Pre-oxygenation (goal of expired FiO2 >85%)
  – Step-wise Trendelenburg
  – High inspiratory O2 fractions
  – Recruitment (large, manual lung inflations)
  – Recruitment (use of PEEP)
  – Keep intra-abdominal pressure <15mmHg
Robotics in Obese Patients
Anesthesia

- Clinical judgment and comfort
- Avoid quick “giving up”
- Importance of a skilled and dedicated TEAM in OR
- Good communications between surgeons and anesthesiologists
- Intraop concerns do not usually translate to postop
  “You give me a little more trendelenburg, and I can get us out of here a lot faster.”
- Much worse to convert!!
Robotics in Obese Patients
Conversion

BMI = 70
Robotics in Obese Patients
## Endometrial CA Staging: Obesity

<table>
<thead>
<tr>
<th></th>
<th>Robotic</th>
<th>Open</th>
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<tbody>
<tr>
<td>N</td>
<td>109</td>
<td>191</td>
</tr>
<tr>
<td>BMI</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Op Time*</td>
<td>228</td>
<td>143</td>
</tr>
<tr>
<td>EBL*</td>
<td>109</td>
<td>394</td>
</tr>
<tr>
<td>CTL%</td>
<td>15</td>
<td>-</td>
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<tr>
<td>LOS*</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>LN count</td>
<td>25</td>
<td>24</td>
</tr>
<tr>
<td>Complication % *</td>
<td>11</td>
<td>27</td>
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</table>

*Seamon et al. Obstet Gynecol 2009*
<table>
<thead>
<tr>
<th></th>
<th>Robotic (49)</th>
<th>L/S (32)</th>
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<tr>
<td></td>
<td>Obese</td>
<td>M. Obese</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>36</td>
<td>13</td>
</tr>
<tr>
<td><strong>BMI</strong></td>
<td>30-39.9</td>
<td>40+</td>
</tr>
<tr>
<td><strong>Op Time</strong></td>
<td>200</td>
<td>179</td>
</tr>
<tr>
<td><strong>EBL</strong></td>
<td>65</td>
<td>85</td>
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<tr>
<td><strong>CTL%</strong></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>LOS</strong></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>LN count</strong></td>
<td>33</td>
<td>27</td>
</tr>
</tbody>
</table>

Gehrig et al. Gynecol Oncol 2008
Controversies

• Direct-to-consumer advertising strategies
• Payments for hysterectomy are the same for robotic hyst and L/S hyst.
• Interests and demands for evidence-based medicine
Controversies

“Robotic surgery is not the only or the best minimally invasive approach for hysterectomy, nor is it the most cost-efficient. Vaginal hysterectomy…is the least invasive and least expensive option. …this is the procedure of choice whenever technically feasible. When this approach is not possible, laparoscopic hysterectomy is the second least invasive and costly option for patients.”

- James Breeden, ACOG President, 03/14/2013

- The Society of Gynecologic Oncology does not disagree with ACOG's statement in the setting of straightforward gynecologic surgery. SGO agrees that for more complex surgery, including gynecologic malignancy, that robotic surgery may offer advantages.

- SGO consensus statement, 2011
Robotics - Costs

- Benign disease
- Observational cohort study, not RCT
- Perspective Database (Premier)
- Samples 441 acute care hospitals
- Represents about 15% of nationwide hospitals
- Robotic hyst vs laparoscopic hyst

Wright et al. JAMA 2013
Robotics - Costs

From 2007 - 2010

• Robotic hyst increased 0.5% - 9.5%
• Robotic hyst accounts for 22.5% of all hysterectomies in hospitals where da Vinci is available
• $2000 more per case compared to L/S hyst ($8,868 vs $6,679)
• no difference in clinical outcomes

Wright et al. JAMA 2013
Robotics - Costs

Wright et al.  JAMA 2013
A Different Perspective – Benign Hyst
More MIS cases due to more robotic cases!

U.S. BENIGN HYSTERECTOMY MARKET BY MODALITY
Estimated Adoption of Minimally Invasive Surgery (MIS)

Percentage of all procedures

- OPEN
- VAGINAL
- LAPAROSCOPY
- DA VINCI

IMPACT OF ROBOTIC SURGERY:
Prior to the introduction of robotics, many hysterectomies were performed via open incision. A number of complexities can prevent patients from receiving a traditional MIS approach.

Surgical complexities may include:
- High patient BMI
- Size of uterus
- Scarring from prior surgeries
- Multiple C-sections

The enhanced visualization, precision, and control enabled robotics help overcome these limitations.

1. Inpatient data: Nationwide Inpatient Sample (NIS), Healthcare Cost and Utilization Project (HCUP), Agency for Healthcare Research and Quality.
2. Outpatient data: Solucient® Database - Truven Health Analytics (Formerly Thomson-Reuters)
3. da Vinci data: ISI Internal Estimates
• These patients are not the patients I see everyday.
• Does not address gynecologic cancers
• Does not address co-morbidities
Well, Let’s Talk CA Then…

- Endometrial cancer
- Observational cohort study, not RCT
- Perspective Database (Premier)
- Samples >500 acute care hospitals
- Represents about 15% of nationwide hospitals
- Robotic vs laparoscopic hyst for EMCA staging
- 41.7% had L/S hyst, 52.3% had robotic hyst
- Robotic hyst costs $1,291 more (mean hospital costs $10,618 vs $8,996)
- No significant difference in clinical outcomes

Wright et al. JCO 2012
A Different Perspective

• “…if all 1,680 MIS hysterectomies performed in 2009 were done robotically, direct hospital costs would have been increased by more than $2,000,000.”

-Wright et al. JCO 2012
A Different Perspective - EMCA

U.S. MALIGNANT HYSTERECTOMY MARKET BY MODALITY

Estimated Adoption of Minimally Invasive Surgery (MIS)

Percentage of all procedures

FDA clearance of da Vinci Surgery GYN, 2005

IMPACT OF ROBOTIC SURGERY

Since 2012, over 70% of US gynecologic cancer patients now receive a minimally invasive procedure.

Prior to robotic surgery, less than 15% of these patients received a minimally invasive surgical option.

A number of complexities can prevent patients from receiving a traditional MIS approach.

Surgical complexities include:
- Stage of disease
- High patient BMI
- Size of uterus

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Controversies – Key Points

- Patient selection, selection, selection!
- The robot is just a tool
- Focus on decreasing rate of abdominal hysterectomy
- Allow time for learning curve
- Use dedicated team to improve cost-efficiency
- Physical impact on surgeons
- Evolution of technology and costs
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- Evolution of technology and costs
Physical Impact
Evolution of Technology - Costs

1975
$19,975

2013
$499
¡iRobot, do you?