Robotic Surgery for Benign Gynecology

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Learning Objectives

- Disclosures- None

Learning Objectives

- Why do we need it?
- What can you do with it?
- What is the evidence?
- What does it cost?
- Who should use it?
Does your hospital own a robot?
1. Yes
2. No
3. Don’t know
4. Don’t work in a hospital

68% 21% 3% 8%

Do you perform robotic surgery?
1. Yes
2. No
3. Plan to learn
4. Don’t perform gyn surgery

48% 21% 8% 23%

- daVinci robot and surgeon console
- Port placement
- Image of da Vinci robot and surgeon console
- Image of port placement with labels: Assistant, Camera, da Vinci
Is there evidence that laparoscopy is better than laparotomy?

How do we measure better?

- Safer
  - Fewer complications
  - Less blood loss/fewer transfusions
- Improved outcomes
  - Higher success rates
  - Longer duration of symptom relief
- Easier for the patient
  - Shorter hospitalization
  - Faster recovery
  - Less pain
- Less expensive?

Conventional Laparoscopy vs. Laparotomy

L/S Advantages:

- Shorter hospital stays
- Faster return to activities
- Less post-op pain and narcotic use
- Less intra-op blood loss

Nieboer TE et al Surgical approach to hysterectomy for benign gynaecological disease. Cochrane Database of Systematic Reviews 2009, Issue 3


Is there evidence that laparoscopy is better than laparotomy?

YES

Conventional Laparoscopy

Challenges:
- Steep learning curve
- Long operative times
- Counter-intuitive hand motions
- 2-dimensional image
- Limited range of motion for instruments
- Challenging ergonomics
- Tremor amplification
- Unsteady camera support

Conventional vs. Robotic Laparoscopy

- Steep learning curve
- Long operative times
- Counter-intuitive hand motions
- 2-dimensional image
- Limited range of motion for instruments
- Poor ergonomics
- Unsteady camera support
- Tremor amplification

- Steep learning curve
- Even Longer operative times
- Natural hand motions
- 3-dimensional image
- “Wristed” instruments
- Superior ergonomics
  - Unless you’re the assistant!
- Steady camera support
- Tremor elimination

What are the tangible advantages of the robot?

- Facilitates suturing
- Better depth perception
- Eliminates feeling the weight of the abdominal wall
- Increases comfort for the operating surgeon
Robot-Assisted Laparoscopy

Limitations
- No tactile feedback
- Fewer electrosurgical instrument options
  - Vessel sealing device now available
- Inability to change patient position intra-op
- Equipment size requires large OR
- Expensive
- More on this topic later in the presentation

What operations can be done robotically?

A Partial List:
- Urology
  - Radical prostatectomy
  - Partial nephrectomy
  - Radical cystectomy
  - Adrenalectomy
- Cardiac Surgery
  - CABG
  - Mitral valve surgery
- General Surgery
  - Gastric bypass
  - Colectomy
  - Achalasia
- Neurosurgery
  - Brain and spine procedures
- Vascular Surgery
  - Aortobifemoral bypass
- Pediatric Surgery
- Head and Neck Surgery
  - Pharyngeal malignancies
  - Thyroid/Parathyroidectomy

What operations can Gynecologists do robotically?

- Hysterectomy
- Myomectomy
- Sacrocolpopexy
- Complex dissections for adhesions or endometriosis
- Tubal reanastamosis
- Abdominal cerclage
- Ovarian cystectomy
- BSO
- Diagnostic laparoscopy

What operations should Gynecologists perform robotically?

Criteria for “better”:
- Safer for the patient
  - Fewer complications
  - Less blood loss
- Improved outcomes
  - Higher success rates
  - Longer duration of symptom relief
- Easier for the patient
  - Laparoscopy instead of laparotomy
  - Out-patient instead of in-patient procedure
  - Less pain
  - Faster recovery
“Better” Surgery: Convert laparotomy to laparoscopy

Examples:

- Myomectomy- Multi-layer closure of uterine wall defect difficult to achieve with conventional laparoscopy
- Sacrocolpopexy- Improved dexterity for positioning and securing mesh
- Tubal reanastamosis- Ability to perform microsurgical techniques
- Abdominal cerclage- Midline laparotomy converted to laparoscopy

What is the evidence for robot-assisted laparoscopy?

From: Robotically Assisted vs Laparoscopic Hysterectomy Among Women With Benign Gynecologic Disease

Robotic vs. Laparoscopic Hysterectomy

Data from 2009-2010 Nationwide Inpatient Sample
- 804,551 hysterectomies for benign disease
  - Abdominal 55%
  - Vaginal 20%
  - Laparoscopic 20%
  - Robotic 5% (4% → 6%)

Rosero EB et al Obstet Gynecol 2013;122:778-86
Robotic vs. Laparoscopic Hysterectomy

No difference in:
- Complication rates
  - More blood txns in L/S hyst group (2 vs 3%)
  - More pneumonia in robotic hyst group
- Length of stay
- Patient outcomes

Rosero EB et al Obstet Gynecol 2013;122:778-86

Higher cost: $2500 per surgery
- $9800 (robot) vs. $7300 (L/S)
- Increased cost due to equipment expenses

Conclusions
- Higher cost with comparable outcomes

Rosero EB et al Obstet Gynecol 2013;122:778-86

A randomized trial comparing conventional and robotically assisted total laparoscopic hysterectomy

- N=52
- OR time: 77 min longer for robotic cases
- No difference in clinical outcomes


Robot-Assisted vs. Conventional Total L/S Hysterectomy

<table>
<thead>
<tr>
<th></th>
<th>Robot TLH N=47</th>
<th>Conventional TLH N=48</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>OR time (min)</td>
<td>106</td>
<td>75</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Quality of Life Index</td>
<td>13</td>
<td>5</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>EBL (ml)</td>
<td>87</td>
<td>79</td>
<td>NS</td>
</tr>
<tr>
<td>Intra-op complications</td>
<td>12</td>
<td>7</td>
<td>NS</td>
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</tbody>
</table>

Sarlos D et al Obstet Gynecol 2012; 120:604-11
### Robot-Assisted L/S Myo vs. Abdominal Myomectomy

<table>
<thead>
<tr>
<th></th>
<th>RALM N=29</th>
<th>Abd Myo N=29</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBL (ml)</td>
<td>196 +/- 229</td>
<td>365 +/- 473</td>
<td>.0112</td>
</tr>
<tr>
<td>LOS (d)</td>
<td>1.48 +/- 0.95</td>
<td>3.62 +/- 1.5</td>
<td>&lt; .0001</td>
</tr>
<tr>
<td>OR Time (min)</td>
<td>231 +/- 85</td>
<td>154 +/- 43</td>
<td>&lt;.0001</td>
</tr>
</tbody>
</table>


### Cost analysis of abdominal, laparoscopic, and robotic-assisted myomectomies

#### Decision model to compare costs

- **Abdominal Myomectomy**: $4937
- **Laparoscopic Myomectomy**: $6219
- **Robot-assisted L/S Myomectomy**: $7299

- Abdominal route least expensive unless length of stay exceeds 4.6 days
- Laparoscopic route less expensive than robotic route unless robotic disposable equipment < $1400

**Postoperative Outcomes after Robotic vs. Abdominal Myomectomy**

**RALM, n=16:**
- Shorter LOS
- Faster return to work

**Abd Myo, n=23:**
- Shorter OR time
- Less residual fibroid volume

Griffin L et al JSLS 2013:17:407-413

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**Robot-Assisted L/S Sacrocolpopexy vs. Abdominal Sacrocolpopexy**

<table>
<thead>
<tr>
<th></th>
<th>Robot SCP N=73</th>
<th>Abd SCP N=105</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBL (ml)</td>
<td>103 +/- 96 ml</td>
<td>255 +/- 155 ml</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>LOS (d)</td>
<td>1.2</td>
<td>2.7</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>OR time (min)</td>
<td>328 +/- 55 min</td>
<td>225 +/- 61 min</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Complications</td>
<td></td>
<td></td>
<td>NS</td>
</tr>
</tbody>
</table>


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**Robot-Assisted L/S Adnexectomy vs. Conventional L/S Adnexectomy**

<table>
<thead>
<tr>
<th></th>
<th>Robot-Assisted N=85</th>
<th>Conventional L/S N=90</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBL (ml)</td>
<td>39 +/- 32</td>
<td>41 +/- 30</td>
<td>.65</td>
</tr>
<tr>
<td>LOS (d)</td>
<td>0.15</td>
<td>0.28</td>
<td>.25</td>
</tr>
<tr>
<td>OR time (min)</td>
<td>83 +/- 31</td>
<td>71 +/- 35</td>
<td>&lt;.01</td>
</tr>
<tr>
<td>Complications</td>
<td></td>
<td></td>
<td>NS</td>
</tr>
</tbody>
</table>

Magrina JF et al. Obstet Gynecol 2009:114;581-4

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**What is the evidence for robot-assisted laparoscopy?**

- Small randomized clinical trials
- Retrospective observation studies
- Robotic surgery takes longer and costs more without clinically significant improvement compared to conventional laparoscopy
What does a robot cost?

daVinci Surgical Systems

- Robot equipment: $2 - 2.5 million
- Hospital service contract: ~ $150,000 /yr
- Direct costs per case: $950-1400
  - Re-usable instruments: $2000 each
    - Expire after 10 cases
  - Each instrument costs $200 per case

Should **YOU** learn to operate with the robot?

Estimate how many robotic cases before gyn surgeons become proficient

1. 10-20
2. 30-40
3. 50-75
4. >100
**The Learning Curve**

How many cases to become proficient?
- Retrospective review by 2 gyn laparoscopists in private practice
- 113 pts in 22 months
- Case mix: 87% hysterectomies
  - Mean wt: 184 gm (range 25-623 gm)
- Conclusion: “In the hands of surgeons w/ advanced laparoscopic skills, the learning curve to stabilize operative times... is 50 cases”


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**Operative Times for Robot-Assisted Hysterectomy**

- Mean Operative Time (min)
- Case Number: 1-25, 26-50, 51-75, >75


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**Operative time for 100 Conventional TLH vs. last 25 Robotic TLH cases**

- Mean Operative Time (min)
- Anesthesia, Skin-to-skin

Keys to a successful robotic program

- Dedicated OR team
- High surgical volume
- Appropriate patient selection
- Cooperation between surgical specialties

Common reasons for selecting robotic route

- Requested by patients
- Encouraged by hospital
- Maintenance of robot credentials
- Offered by Gyn competitors
- Decreases need for Gyn assistant
- Greater comfort

Be aware/Beware of Direct to Consumer Marketing Influences

Examples:
- Hospital websites promoting robotic procedures to attract new patients
- National and local “news” stories championing robot technology
- Popular tv shows featuring robotic surgery

Let’s await the results of well-designed, prospective studies to guide appropriate use of robotic surgery

Conclusions

- No evidence to show a clinical advantage of robot-assisted compared to conventional laparoscopy
- Based on current data, OR time and expense increased w/ robot
- Expect long learning curve
- Make goal of robot-assisted surgery to reduce rates of laparotomy
Robot-Assisted Gynecologic Surgery

Clinical advancement or Expensive gadget?

Yes to both. Use the robot appropriately.

Robot-Assisted L/S Tubal Reanastomosis vs. Out-Pt Mini-lap Tubal Reanastomosis

<table>
<thead>
<tr>
<th></th>
<th>Robot Tubal Reanastomosis N=26</th>
<th>Mini-lap Tubal Reanastomosis N=41</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBL, &lt; 100 ml (%)</td>
<td>19 (73)</td>
<td>31 (80)</td>
<td>.48</td>
</tr>
<tr>
<td>LOS (min)</td>
<td>99 (52-159)</td>
<td>142 (82-349)</td>
<td>.14</td>
</tr>
<tr>
<td>OR time (min)</td>
<td>229 (205-252)</td>
<td>181 (154-202)</td>
<td>.001</td>
</tr>
<tr>
<td>Time out of work (wk)</td>
<td>0.8 (0.5-2.9)</td>
<td>2.8 (1.0-3.4)</td>
<td>.013</td>
</tr>
<tr>
<td>Pregnancy rates (%)</td>
<td>61</td>
<td>79</td>
<td>.10</td>
</tr>
</tbody>
</table>


Caution: Vaginal Cuff Dehiscence

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of Robotic Procedures</th>
<th>No. of Vaginal Cuff Dehiscences</th>
<th>Incidence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>61</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2005</td>
<td>71</td>
<td>1</td>
<td>1.5</td>
</tr>
<tr>
<td>2006</td>
<td>97</td>
<td>2</td>
<td>2.1</td>
</tr>
<tr>
<td>2007</td>
<td>119</td>
<td>7</td>
<td>5.9</td>
</tr>
<tr>
<td>2008</td>
<td>162</td>
<td>11</td>
<td>6.8</td>
</tr>
<tr>
<td>Total</td>
<td>510</td>
<td>21</td>
<td>4.1</td>
</tr>
</tbody>
</table>

Half of all robotic procedures are performed for gynecologic indications