Plenary 4 – Robotics

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Professional Education Information

Target Audience
This educational activity is developed to meet the needs of residents, fellows and new minimally invasive specialists in the field of gynecology.

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Plenary 4 – Robotics

Moderator: Nita A. Desai

Faculty: Michael T. Breen, Souzana Choussein, Daniel D. Gruber, Amanda L. Jackson, Dana C. Morrison, J. Biba Nijjar, Matthew M. Palmer, Lauren D. Schiff, Meir Jonathon Solnik, Sabrina Whitehurst

This session provides insight on the impact of Robotic surgery in the field of minimally invasive gynecology surgery. As traditional laparoscopy and robotics compete for both physician and patient consideration, this platform provides the opportunity for discussion regarding these distinctions. As patients become increasingly aware of their ability to have a choice in surgical approach, the true benefit of robotic surgery over all other modalities, if one exists, must be explored. This session discusses benefits as well as complications associated specifically with robotic surgery.

**Learning Objectives:** *At the conclusion of this course, the clinician will be able to:* 1) Identify aspects of robotic surgery that directly impact resident training; 2) recognize the nuances between robotic and laparoscopic surgery when choosing surgical approach; and 3) identify the ways in which robotic surgery affect the OR environment.

**Course Outline**


3:30  Does the Robotic Platform Overcome Hand Dominance in Gynecologic Surgeons?  A.L. Jackson


4:00  Outcomes of Vaginal Cuff Closure Techniques in Robotic Hysterectomy: A Prospective Randomized Trial  M.M. Palmer

4:10  Validation of a Simulation Tool to Support Robotic-Assisted Surgical Training  S. Whitehurst

4:20  Rates of Vaginal Cuff Dehiscence after Total Robotic Hysterectomy  D.C. Morrison

4:30  The Effects of Magnification on Distance Estimation during Robotic Suturing  D.D. Gruber

4:40  Nationwide Frequency of Robotic Sacrocolpopexy and Associated Factors  J.B. Nijjar

4:50  Dual Console Robotic Platforms as Novel and Extremely Effective Teaching/Learning Modalities in Collaborative Dual Specialty Cases, Resident Education and Surgeon Training  M.T. Breen

5:00  Closing Remarks/Adjourn
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Other: Proctor: Intuitive Surgical
John F. Dulemba
Grants/Research: Abbott Laboratories, Intuitive Surgical
Speakers Bureau: Intuitive Surgical, Lexion Medical, Teleflex
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Matthew M. Palmer*
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Sabrina Whitehurst*

Asterisk (*) denotes no financial relationships to disclose.
Challenges in Robotic Surgery: Reducing Flow Disruptions

M. Jonathon Solnik, M.D., FACOG FACS
Jennifer Anger, M.D., MPH

Objectives

• Evaluate efficiency, safety & quality of robotic cases performed across different disciplines
  • Assess team dynamics
  • Analyze surgical steps and times
• Goals:
  • Improve efficiency
  • Reduce learning curve
  • Reduce expenses

Flow Disruptions (FD)

• Anything that disrupts the natural progression of patient care
• Shown to impact care in many areas of surgery
• Occur every 5–10 minutes
• Correlate with surgical errors

Methods

• IRB approval with waiver of consent
• All robotic surgeons at CSMC agreed to participate
• Training with experts in human factors research on observation techniques
  • Dual observers
  • Verification with expert observer
• Direct observation of 25 robotic cases

Financial Disclosures

I have no financial relationships to disclose.
Methods

• Detailed notes taken electronically
• FD’s sorted by category
• Collect de-identified patient data
• Note operative times

Steps

Establish common surgical steps:
• Step 1: patient arrival to room
  induction of anesthesia
• Step 2: port placement
  robotic cart docking
• Step 3: procedure
• Step 4: robotic cart undocking
  incision closure

Types of FD’s Identified

<table>
<thead>
<tr>
<th>Categories</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication</td>
<td>Misunderstanding</td>
</tr>
<tr>
<td>Coordination</td>
<td>Missing Equipment</td>
</tr>
<tr>
<td>External</td>
<td>Incoming cell phone call</td>
</tr>
<tr>
<td>Training</td>
<td>Surgeon fixing resident errors</td>
</tr>
<tr>
<td>Equipment</td>
<td>Malfunctions</td>
</tr>
<tr>
<td>Environment</td>
<td>Loud noise, Temperature</td>
</tr>
<tr>
<td>Patients Factors</td>
<td>Variant anatomy, Obesity</td>
</tr>
</tbody>
</table>

Scenario: Communication Disruption

1. Surgeon: “Hand me the big blue grasper”
2. Scrub: hands an instrument
3. Surgeon: “No, the big blue grasper”
4. Scurb: “That’s what I gave you!”
5. Surgeon: “No, it’s not!”

Results

• CSMC Patient Demographics:
  • Mean age: 57 years
  • 80% of patients > 50 years
  • 60% of patients > 65 years

FD Results

• Average events per robotic case: 48 FD’s

• 12 different surgeries and 15 robotic surgeons

• 2 new FD categories identified:
  • Robotic instrument exchanges
  • Surgeon decision-making
Conclusions

- Robotic surgery has unique steps associated with specific types of FD’s
- FD’s vary by surgical step and operation type
- Surgical technique is only one part of the learning curve in robotic surgery
- Reducing FD’s will significantly decrease operative time and improve safety

Tell me and I forget; show me and I remember; involve me and I understand (Chinese proverb)

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- John Fritch (MS1)
- Catherine Bresee, M.S.
- Raymundo Avenido
- David Kim, M.D., M.S., MBA
Does the robotic platform overcome hand dominance in gynecologic surgeons?

Amanda L. Jackson, MD
Gynecologic Oncology Fellow

Disclosure

I have no financial relationships to disclose.

Handedness

• An unequal distribution of fine motor skills between the right and left hands
• Traditional surgical techniques favor the right hand dominant surgeon
• Traditional surgery allows the surgeon to favor one hand for complex tasks
• Laparoscopy requires dual dexterity to operate and maneuver instruments

Hand Dominance

• Grantcharov et al:
  » Right handed surgeons performed fewer unnecessary movements using a laparoscopic trainer
• Schueneman et al:
  » Left-handed surgeons were more reactive to stress, more cautious, and more proficient on tactile-spatial abilities
• Hanna et al:
  » Significant difference in error rate and first time accuracy between dominant and non-dominant hands
  » Practice has minimal effect

Robotic Surgery

• Compared to laparoscopy
  » Shorter operative times
  » Faster learning curve
  » Enhanced dexterity
  » Improved ergonomics
  » Tremor filtration
  » 3-D vision
• Mucksavage et al:
  » Difference in hand dominance in open skills
  » No difference in hand dominance in robotic skills

Objective

• To determine if the robotic platform can overcome hand dominance in gynecologic surgeons

• At the conclusion of this activity, the participant will be able to evaluate the robotic platform’s influence over hand dominance
Methods

• Retrospective Study
• Inclusion criteria
  » 2005 – 2012
  » Robotic-assisted laparoscopic surgery (RAS) that included bilateral pelvic +/- periaortic lymphadenectomy
  » Console surgeon listed by procedure
• Exclusion Criteria
  » Bilateral procedures were not performed
  » Right and left sides were performed by different surgeons
  » Procedure was performed by multiple surgeons

• Compared the surgeon’s dominant side and non-dominant side
  » Dominant side = hand dominance
  » Right and left pelvic and periaortic lymphadenectomy
  » Difference between the number of nodes removed
  » Difference between surgical time
• Clustered Wilcoxon signed-rank test
• Statistical analyses were performed with SAS 9.3 statistical software

Results

• RAS for gynecologic malignancies
  » 668 patients → 357 excluded
  » 311 surgeries included

<table>
<thead>
<tr>
<th>Pelvic Lymphadenectomy</th>
<th>Periaortic lymphadenectomy</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 Attending surgeons (80%)</td>
<td>3 attending surgeons (92.8%)</td>
</tr>
<tr>
<td>Range: 3-194</td>
<td>Range: 16-125</td>
</tr>
<tr>
<td>9 Fellow surgeons (20%)</td>
<td>5 Fellow surgeons (7.2%)</td>
</tr>
<tr>
<td>Range: 2-13</td>
<td>Range: 1-4</td>
</tr>
<tr>
<td>12 Right handed surgeons</td>
<td>6 Right handed surgeons</td>
</tr>
<tr>
<td>2 Left handed surgeons</td>
<td>2 Left handed surgeons</td>
</tr>
</tbody>
</table>

Results

Dominant – Non-dominant periaortic lymph node yield – Attending surgeons

Results

Dominant – Non-dominant pelvic lymph node yields
Results

Dominant – Non-dominant operative times

Discussion

- Robot platform appears to negate innate handedness
- Hand dominance is not demonstrated in training surgeons
- The elimination of laterality may be another benefit of robotic surgery over traditional laparoscopy or laparotomy.

References

Do Current Systems of Credentialing Ensure Patient Safety in Robotic Gynecologic Surgery?

A survey study

Lauren D. Schiff, MD
Fellow in Minimally Invasive Gynecologic Surgery with Matthew Palmer, DO and David Eisenstein, MD

Henry Ford Health System
Division of Minimally Invasive Gynecology
Detroit, MI

Disclosures

No financial relationships to disclose

Learning Objective

• At the conclusion of this activity, the participant will be able to assess whether credentialing programs serve to sufficiently ensure the appropriate use of robotic surgery in gynecology

Background

• Debate over the appropriate application of robotics in Gynecology
  • cost-efficiency
  • patient safety
  • learning curve
  – ACOG Statement on Robotic Surgery (Mar 2013)
  – AAGL Position Statement (Jan 2013)

Study Objective

• Assess whether credentialing ensures appropriate use of the robot in gynecologic surgery
  – Safety
  – Learning curve

• Assess attitudes towards use of robotics
Methods

- Design:
  - Anonymous, voluntary internet-based survey study
  - Survey distributed to ACGME OBGYN trainees and affiliated attendings
  - Self-selected respondents
  - Two versions: Attending and Trainee

- Measurements:
  - Fisher exact test (p=0.05)

Results: Credentialing

- Formalized robotic credentialing: 69.3%
  - Granted after 1-5 robotic cases: 55%
  - Maintenance: No minimum ~50%

- Number cases bedside assisted prior to console:
  - 1-5 cases: 44%
  - 6-10 cases: 14%

Results: Learning Curve

- Cases (#) needed to be independent (p<0.05)
  - Attendings: 21.7% report 20+ cases
  - Trainees: 57.31% report 20+ cases

- Trainees report Attendings book cases above their skill level at a significantly higher rate than Attendings report about themselves

Results: Patient Safety

- Attendings are credentialed for robotic GYN surgery who lack the skills to perform such surgery safely on a consistent basis (p>0.05).
  - Attendings: 26.67%
  - Trainees: 32.79%

Results: Intersection

- Strongly agree that robotic surgery consistently benefits patient outcomes (p<0.05).
  - Trainees: 17.98%
  - Attendings: 36.51%

- The robot is being not applied to appropriate cases on a consistent basis (p>0.05).
  - Trainees and Attendings: 33%

- Wished there were someone more expert in the room (p>0.05).
  - Trainees and Attendings: ~30%

- Robotic surgery makes MIS more accessible to those lacking straight stick laparoscopic skills
  - Trainees and Attendings: ~70%

- Robotic surgery is marketed to to those lacking straight stick laparoscopic skills.
  - Trainees and Attendings: ~55%

- Institution wants more gynecologists to be robotically trained.
  - Trainees and Attendings: ~55%
Conclusions/Discussion

- Credentialing programs are inconsistent
- Shared Perception of lack of
  - Expertise: Tendency to book cases above skill level
  - Oversight: Improved management of learning curve needed
  - Patient Safety: Concern of trainees and attendings
- Credentialing Pathways:
  - Means to achieve the most cost-effective use of the robot with the best patient outcomes?
- Role of governing bodies (AAGL/ACOG) to provide standards

Limitations

- Self-selected respondents
- Subjective responses
- Small numbers
  - Larger N needed to perform within group correlations

References

OBJECTIVES

• Report our experience with RA-SIL myomectomy and adenomyomectomy with standard da Vinci Si system

• Provide essential technical detail to enable replication of this technique by advanced robotic surgical teams

BACKGROUND

➢ Single incision laparoscopy (SIL) for major gynecologic procedures
  ➢ ultra-minimally invasive approach with potential clinical and cosmetic benefits on account of a reduced number of abdominal incisions
  ➢ Robot-assisted SIL overcomes several ergonomic issues present in conventional SIL
  ➢ enabling nature even more evident in suture-intensive procedures
  ➢ First reported robot-assisted SIL myomectomy performed at BWH

FUNDAMENTAL TECHNICAL POINTS:

✓ Exclusion of robotic arm #2

✓ Perpendicular positioning and periscopic use of a 10° "up" Da Vinci robotic laparoscope

✓ Utilization of the GelPOINT multi-access platform

VIDEO 1: SET-UP OF THE ROBOTIC CART
Patient characteristics

<table>
<thead>
<tr>
<th>Age (mean ± SD)</th>
<th>46.8 ± 4.9 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI (mean ± SD)</td>
<td>31.6 ± 5.9 kg/m²</td>
</tr>
<tr>
<td>Largest myoma size (mean ± SD)</td>
<td>5.2 ± 2 cm</td>
</tr>
</tbody>
</table>

Myoma type

- intramural: 7
- submucosal: 4
- subserosal: 5
- focal adenomyoma: 1

Main presenting symptoms

- severe menorrhagia
- lower abdominal pressure
- urinary symptoms
- infertility

RESULTS

<table>
<thead>
<tr>
<th>Patient ID</th>
<th>Operative time (min)</th>
<th>Estimated blood loss (cc)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>173</td>
<td>25</td>
</tr>
<tr>
<td>2</td>
<td>130</td>
<td>50</td>
</tr>
<tr>
<td>3</td>
<td>220</td>
<td>150</td>
</tr>
<tr>
<td>4</td>
<td>227</td>
<td>25</td>
</tr>
<tr>
<td>5</td>
<td>152</td>
<td>25</td>
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<td>6</td>
<td>158</td>
<td>25</td>
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<tr>
<td>7</td>
<td>189</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td>133</td>
<td>25</td>
</tr>
<tr>
<td>9</td>
<td>173</td>
<td>25</td>
</tr>
<tr>
<td>Total (mean ± SD)</td>
<td>172.8 ± 34.5</td>
<td>39 ± 43</td>
</tr>
</tbody>
</table>
RESULTS

• No conversion to conventional SIL, multi-port laparoscopy or open surgery

• No post-operative complications; all patients discharged home on day of surgery

CONCLUSIONS

➢ Safe and reproducible technique in obese patients

➢ Good patient acceptability
  • improved cosmesis
  • less likelihood of injury to abdominal wall nerves or blood vessels

➢ Prospective trials needed
  • evaluate cosmetic and postoperative outcomes
  • define the patient groups that will most benefit from this novel operation

REFERENCES


Outcomes of Vaginal Cuff Closure Techniques in Robotic Hysterectomy: A Randomized Controlled Trial

MATTHEW PALMER, D.O.
OAKDALE OBSTETRICS AND GYNECOLOGY
GRADUATE FELLOW – MINIMALLY INVASIVE GYNECOLOGY
HENRY FORD HEALTH SYSTEM

Objectives

- No currently published randomized trials reported on comparison of cuff closure techniques in robotic hysterectomy.
- Pilot study comparing all patients undergoing scheduled hysterectomy for benign disease without concomitant urogynecologic procedures.
- Piggy-backs on previous retrospective vaginal cuff closure study done by this division.
- AK Nawfal, et al. Vaginal Cuff Closure During Robotic Assisted Total Laparoscopic Hysterectomy – Comparing Vicryl to Barbed Suture

Study Design

- Prospective, randomized study
- Patients informed about the study opportunity at time of consultation or pre-op appt.
  - Patients told they would be randomized to one of three well described, evidence based techniques for cuff closure and then followed for outcome measures over one-year
  - 3 arms: running V-Loc™, Vicryl™ figure-of-eight, running Vicryl with LapraTy®
  - Pilot study with 90 patients enrolled as of 4/27/12

Study Design – Short Term

- Electronic medical records reviewed at 6 weeks post-op and post-op office visit data recorded
  - Data points included:
    - Smoking status
    - Co-morbidities
    - Readmission rate
    - EBL
    - Percent change in Hgb
    - Cuff closure time (minutes)
    - Review of EMR for readmission and/or ER visits
    - Post-op exam including inspection of healing vaginal cuff
  - Cost of suture material and number of incisions necessary to complete closure also considered

Study Design – Long Term

- Patients sent a letter letting them know they would receive a phone call regarding the vaginal cuff closure study
- Phone call to patient at ~ 1 year after surgery
  - Standardized questionnaire administered:
    - Vaginal bleeding/spotting and whether or not treatment required
    - New episodes of vaginal pain
    - Vaginal discharge or infection
    - New onset dyspareunia

Disclosures

I have no financial relationships to disclose.
Description of techniques

- **V-Loc™ 90 absorbable suture**
  - Two 9 in. lengths used, one anchored in each corner of vaginal cuff and thrown through each uterosacral ligament.
  - Suture is run to mid-line of cuff and then doubled back across the cuff in “double-layer” closure.
  - Needles passed in and out of abdomen using vaginal trocar and in some cases via 12 mm accessory port

- **0 Vicryl™ absorbable suture, Figure of 8’s**
  - 10 in. lengths used, anchored in each corner of cuff and thrown through each uterosacral ligament
  - Additional figure of 8 sutures thrown across cuff until closed
  - Sutures passed in and out of abdomen using vaginal trocar and in some cases 12 mm accessory port

- **0 Vicryl™ absorbable sutures with Lapra-Ty® absorbable clip**
  - Lapra-Ty applied to end of each of two 10 in. lengths of suture
  - Each corner of cuff anchored to uterosacral ligament and run across to cuff mid-line
  - Suture anchored at mid-line with additional Lapra-Ty
  - Needles passed in and out of abdomen using 12 mm accessory port

Description of techniques

Short term results

- Closure type NOT associated with:
  - EBL (p=0.34)
  - Vaginal cuff closure time (p=0.09)
  - Percent change in hemoglobin (p=0.44).
  - Based on logistic regression model, the odds of readmission were not different between arms (OR=0.63, 95% CI 0.235, 1.70 95% CI).

Long term Results

- Calls have been made to all 90 patients and all those reached (54/90 – 60%) have answered all questions completely.
- Interpretation of these data should be made with caution due to only 60% of completed follow up data collection and overall small sample sizes.

<table>
<thead>
<tr>
<th>Arm 1</th>
<th>Arm 2</th>
<th>Arm 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.0 V-Loc™</td>
<td>0 Vicryl™ figure-of-8</td>
<td>0 Vicryl™ with Lapra-Ty®</td>
</tr>
<tr>
<td>Number with follow-up</td>
<td>22</td>
<td>19</td>
</tr>
<tr>
<td>Number who answered yes to question 1: Post-surgical bleeding that required call or visit to doctor</td>
<td>6 (27.3%)</td>
<td>1 (5.3%)</td>
</tr>
<tr>
<td>Number who answered yes to question 2: Had new episodes of vaginal pain after recovery</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Number who answered yes to question 3: Abnormal vaginal discharge or infections after hysterectomy</td>
<td>4 (18.2%)</td>
<td>1 (5.3%)</td>
</tr>
<tr>
<td>Number who answered yes to question 4: Any new problems with pain during intercourse after the hysterectomy</td>
<td>2 (9.5%)</td>
<td>2 (11.1%)</td>
</tr>
</tbody>
</table>

*Fisher’s exact test*
Weaknesses

- Small sample size
- Patients lost to follow-up during one year after surgery
- All surgeons performing cuff closure were very experienced in robotic surgery

Strengths

- Randomized
- 3 unique techniques considered
- Long-term follow-up
- Phone survey administered by one consistent interviewer

Conclusions

- It appears that type of closure technique has no significant impact on short or long-term patient outcomes
- Time of cuff closure and thus overall length of case was not affected
- Based on these conclusions, it appears the method that incurs the least expense to the patient and hospital and least morbidity to the patient is the recommended method of closure.
- Multi-center trial is warranted.
- Time of cuff closure may show different results depending on skill and experience level of surgeons.

References


Acknowledgments

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- A. Karim Nawfal, M.D.
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- Jay Fisher, M.D.
- Ganesa Wegienka, Ph.D.
Validation of a Simulation Tool to Support Robotic-Assisted Surgical Training

Sabrina Whitehurst, MD
Walter Reed National Military Medical Center

Objective

- At the end of this activity, the participant should be able to compare surgeon performance on a virtual reality MIMIC dV-Trainer vs FLS dry lab tasks performed on the da Vinci® Surgical System.

Background

- Within the area of robotic surgery, a standardized training and evaluation program does not exist.
- Most military hospitals supporting robotic-assisted surgeries currently have only one robot.
- Studies have shown that virtual reality training translates to improved laparoscopic skills.
- Virtual reality training for robotic surgery has not been externally validated.

Purpose

- To compare the efficacy of simulation-based training (MIMIC dV Trainer) with that of traditional training FLS dry lab tasks performed on the da Vinci® Surgical System.
- Translated to a standardized procedure on a swine model in an effort to potentially reduce or replace requirements for live tissue training.

Design

- A prospective randomized pilot study analyzed the performance of 20 robotics-naive subjects.
- Participants were randomized after completion of an online training course.
- Baseline Spatial Abilities Tests were performed.
- Participants then trained on either the da Vinci robot or the dV-Trainer to proficiency.
- Participants then performed a standardized criterion task on a live animal model.

Disclosure

- I have not financial relationships to disclose.
- The opinion or assertions contained herein are the private views of the authors and are not to be construed as official or as reflecting the views of the Department of Army, Navy, Air Force or the Department of Defense.
Design

- Tool path and video were recorded using SurgTrak™ and the subject's hand motions were tracked using Accelegloves by Anthrotronix.
- Performance was assessed by a panel of experienced surgeons utilizing the validated Global Evaluative Assessment of Robotic Surgery.

Results

There were no significant differences in demographics between the 2 groups.

2-tailed t-tests revealed no significant differences between groups.

- There was no difference in surgeon performance with training on the dV-trainer vs the daVinci robot.
- Based again on a 95% confidence interval for the difference in means (~.803, .543) non-inferiority was also proven in that neither method was inferior to each other.
Secondary Outcomes

- No significant difference between-subjects effects ($F<1$) for glove-based hand velocity and angular rotation.
- No significant difference within-subjects effects for right vs left hand ($F<1$), and no interaction effects ($F<1$).

Conclusions

- Both training curricula showed similar performance.
- Future validation studies are warranted.
- In developing surgical training curriculum in the future, the dV-trainer can be considered as an alternative to traditional daVinci robot surgical training.

References

Objective

- To evaluate the incidence of vaginal cuff dehiscence after total robotic hysterectomy compared to that of the known published rates of dehiscence in other modes of hysterectomy.

Background

- Very little information exists about vaginal cuff dehiscence after robotic surgery; current literature is from small study groups, or studies completed when robotics was in its infancy.
- Cuff dehiscence can be a catastrophic event with complications including sepsis, peritonitis, and bowel evisceration.
- Reported rates of dehiscence range from 0.3% for vaginal hysterectomy, 0.64% for total laparoscopic, and 4.1% for robotic assisted surgery.

Materials and Methods

- A retrospective chart review from 2009-2012, for a total of 500 cases performed by Dr. G. Boike, gynecologic oncologist, using the da Vinci Surgical System.
- A surgical database was created with pertinent patient information including past medical history and physical exam findings, co-morbidities, operative report, surgical findings, and post-operative complications.

Materials and Methods (cont)

- Patient follow up was at 6 weeks, 3 months, 6 months, 9 months, and 12 months.
- Identified cases of cuff dehiscence were further investigated to identify patient information that may have contributed to the cuff dehiscence.
- All cases were performed for either benign or malignant indications.
Results

- We reported a total of 2 vaginal cuff dehiscences, with an overall incidence of 0.4% (CI 0.95%).
- Median age of patients with a vaginal cuff dehiscence was 57 years (range 42-72 years) and median body mass index was 39 kg/m2 (range 29-49 kg/m2).
- Both diabetic and smokers
- Median time for presentation of a vaginal cuff dehiscence was 15.5 days (range 9-22 days).
- Symptoms at the time of presentation included vaginal bleeding.
- Neither patient was diagnosed with a pelvic abscess or cuff cellulitis prior to the dehiscence.

Results (cont)

- A review of literature has shown published rates of vaginal cuff dehiscence as high as 4.1%.
- A recent article at the completion of our study yielded a similar dehiscence rate as ours at 0.4%.

Results (cont)

<table>
<thead>
<tr>
<th>Type and Frequency of Robotic Surgeries Performed Total of 500 Cases</th>
<th>No. of Cases</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robotic assisted hysterectomy with bilateral salpingo-oophorectomy</td>
<td>439</td>
<td>87.80%</td>
</tr>
<tr>
<td>Robotic assisted hysterectomy with unilateral salpingo-oophorectomy</td>
<td>25</td>
<td>5.00%</td>
</tr>
<tr>
<td>Robotic assisted total hysterectomy</td>
<td>20</td>
<td>4.00%</td>
</tr>
<tr>
<td>Robotic assisted staging at time of robotic hysterectomy</td>
<td>16</td>
<td>3.20%</td>
</tr>
<tr>
<td>Robotic assisted pelvic node dissection at time of robotic hysterectomy</td>
<td>347</td>
<td>69.40%</td>
</tr>
<tr>
<td>Robotic assisted peri-aortic node dissection at time of robotic hysterectomy</td>
<td>62</td>
<td>12.40%</td>
</tr>
</tbody>
</table>

Total Number of Robotic Procedures Involving Colpotomy and Closure and Vaginal Cuff Dehiscence Each Year

<table>
<thead>
<tr>
<th>Year</th>
<th># of Robotic Procedures</th>
<th># of Vaginal Cuff Dehiscence</th>
<th>Incidence (%) (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>124</td>
<td>1</td>
<td>0.8 (0.4-1.3)</td>
</tr>
<tr>
<td>2010</td>
<td>148</td>
<td>0</td>
<td>0 (0-0.2)</td>
</tr>
<tr>
<td>2011</td>
<td>152</td>
<td>0</td>
<td>0 (0-0.2)</td>
</tr>
<tr>
<td>2012</td>
<td>76</td>
<td>1</td>
<td>1.31 (0.64-2.18)</td>
</tr>
<tr>
<td>Total</td>
<td>500</td>
<td>2</td>
<td>0.4 (0.2-0.6)</td>
</tr>
</tbody>
</table>

Patient Characteristics With Vaginal Cuff Dehiscence After Robotic Hysterectomy

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age</th>
<th>BMI</th>
<th>Robotic Procedure</th>
<th>Indication</th>
<th>Trigger Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>42</td>
<td>29</td>
<td>Hysterectomy, BSO</td>
<td>Ovarian Mass</td>
<td>Pelvic Unkown</td>
</tr>
<tr>
<td>2</td>
<td>72</td>
<td>49</td>
<td>Hysterectomy, BSO</td>
<td>Grade 2 Uterine adenocarcinoma</td>
<td>Pelvic Unkown</td>
</tr>
</tbody>
</table>

Discussion

- Very limited data concerning vaginal cuff dehiscence after total robotic hysterectomy.
- Our incidence of 0.4% is well below the most often quoted incidences of 1.5% and 4.1%.1,3
- First case had no identifiable cause.
- Second cuff dehiscence can be explained by early coitus.
- Given the short time between surgery and presentation, it is unlikely that these two cases were related to the suture used for cuff closure.
- Per manufacturer, Ethicon, the suture strength at the time of presentation in both cases would be at least 75%.5

Discussion (cont)

- Cuff dehiscence can present as vaginal bleeding, watery discharge, or completely asymptomatic.
- Risks of dehiscence include pelvic prolapse, postmenopausal, increased BMI, immunosuppression, smoking, and early intercourse after surgery4
- Limitations of this study include reporting complications of just a single surgeon and the possibility of loss to follow up.
Conclusion

- As robotic surgery in the field of Gynecology becomes more popular, examining complications and their causes will become even more important.
- Although studies looking at complications for this mode of hysterectomy are few, our data shows that in the hands of an experienced surgeon, the vaginal cuff dehiscence rate is much lower than previously reported.
- Further studies may be completed using this same growing database to also revisit the rate of cuff dehiscence over time, and with more cases at our disposal, we may venture into looking at the rate of other complications that may arise during this innovative approach to hysterectomy.

References

Magnification Effects on Distance Estimation During Robotic Suturing

Daniel D. GRUBER, MS, MD

Disclosures

I have no financial relationships to disclose.

Background

• Laparoscopic and robotic surgery
• Decreased invasiveness, pain, and recovery time
• Complication — Vaginal cuff dehiscence increased
• Electrosurgery, precipitating events, and methods of repair

Objective

• To determine the surgeons’ ability to accurately place sutures at specified distances during robotic surgical closure of a cystotomy
Magnification

- Laparoscopy 2-7x magnification
- DaVinci robot 10x magnification

Materials and Methods

- IACUC approved
- Prospective single-blinded
- Swine

External Sutures
Materials and Methods

Bladder

3 cm

1 cm

Suture to Suture

Suture to Incision

27 cm

27 cm
Demographics

<table>
<thead>
<tr>
<th>Subjects (n=20)</th>
<th>Mean (±SD)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Fellows</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Residents (Chiefs)</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>34.6 (±4.9)</td>
<td>28 – 46</td>
</tr>
<tr>
<td>After completing residency (years)</td>
<td>3.3 (±4.0)</td>
<td>0 - 14</td>
</tr>
</tbody>
</table>

Demographics

<table>
<thead>
<tr>
<th>Predominant Hand</th>
<th>#</th>
</tr>
</thead>
<tbody>
<tr>
<td>Right</td>
<td>18</td>
</tr>
<tr>
<td>Left</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Eye Wear</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Glasses</td>
<td>3</td>
</tr>
<tr>
<td>Contacts</td>
<td>6</td>
</tr>
<tr>
<td>None</td>
<td>11</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specialty</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Gynecology</td>
<td>8</td>
</tr>
<tr>
<td>Urogyn</td>
<td>2</td>
</tr>
<tr>
<td>GynOnc</td>
<td>3</td>
</tr>
<tr>
<td>REI</td>
<td>3</td>
</tr>
<tr>
<td>Urology</td>
<td>4</td>
</tr>
</tbody>
</table>

Results

<table>
<thead>
<tr>
<th>Description</th>
<th>Range</th>
<th>Median</th>
<th>Mean (±SD)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>External Suture 10 mm</td>
<td>3–15</td>
<td>10</td>
<td>9.6 (±3.2)</td>
<td>.59</td>
</tr>
</tbody>
</table>
Results

<table>
<thead>
<tr>
<th>Description</th>
<th>Range</th>
<th>Median</th>
<th>Mean (±SD)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>External Suture 10 mm</td>
<td>3—15</td>
<td>10</td>
<td>9.6 (±3.2)</td>
<td>.59</td>
</tr>
<tr>
<td>Suture to Suture Distance (mm)</td>
<td></td>
<td></td>
<td>6.5 (±1.8)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Suture to Incision Distance (mm)</td>
<td></td>
<td></td>
<td>4.1 (±1.0)</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

Correlation of subject experience

Suture to Suture

<table>
<thead>
<tr>
<th>Suture to Suture</th>
<th>Suture (mm) Mean (±SD)</th>
<th>Suture P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resident</td>
<td>7.2 (±2.4)</td>
<td></td>
</tr>
<tr>
<td>Fellow</td>
<td>6.0 (±1.6)</td>
<td>0.29</td>
</tr>
<tr>
<td>Staff</td>
<td>6.0 (±1.0)</td>
<td></td>
</tr>
</tbody>
</table>

Experience (yrs since residency) r = -0.3 0.22

Correlation of subject experience

Suture to Incision

<table>
<thead>
<tr>
<th>Suture to Incision</th>
<th>Incision (mm) Mean (±SD)</th>
<th>Incision P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resident</td>
<td>4.8 (±0.8)</td>
<td></td>
</tr>
<tr>
<td>Fellow</td>
<td>3.9 (±1.0)</td>
<td>0.03</td>
</tr>
<tr>
<td>Staff</td>
<td>3.6 (±0.8)</td>
<td></td>
</tr>
</tbody>
</table>

Experience (yrs since residency) r = -0.5 0.02

Limitations

- Absolute precision may not be required
  - Clinically relevant
- Training environment
- Close to a human surgery
  - Same instruments
  - Repairing the bladder
Limitations

• Robotic inexperienced participants
• Residents - chief year
• All subjects
  – Mean 3.3 years since graduating residency (including residents)
• All had significant laparoscopic experience

Strengths

• Strengths
  – Baseline Comparison
  – Subjects blinded
  – Real da Vinci® robot
  – Actual tissue
  – Same instruments
• Vaginal cuff dehiscence

Conclusion

• Surgeons consistently underestimate suturing distance
  – Between sutures
  – Sutures to the incision line
  – Worse with experience

Recommendations

• Install measurements on instruments
  – Markings on instrument tips
• Memorize open grasper distance
  – When closing the vaginal cuff

Acknowledgments

• Chamsi Brown, RN
• Todd Larson, RN
• Andrew Fielding

References

## Results

<table>
<thead>
<tr>
<th></th>
<th>Mean (±SD)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Suture</td>
<td>5.3 (±1.4)</td>
<td>51 - 92</td>
</tr>
<tr>
<td>Suturing Time [Sec]</td>
<td>963 (±474)</td>
<td>424 - 1918</td>
</tr>
<tr>
<td></td>
<td><strong>Mean (±SD)</strong></td>
<td><strong>P-value</strong></td>
</tr>
<tr>
<td>Suture to Incision Distance (mm)</td>
<td>3.79 (±0.91)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Suture to Suture Distance (mm)</td>
<td>6.04 (±1.46)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
Nationwide Frequency of Robotic Sacrocolpopexy and Associated Factors

J. Biba Nijjar, MD, MPH

University of Michigan Department of Obstetrics and Gynecology
Division of Minimally Invasive Surgery and Chronic Pelvic Pain

Objectives

- Determine the nationwide frequency of robotic sacrocolpopexy
- Examine patient and hospital factors associated with undergoing robotic versus abdominal sacrocolpopexy

Methods

- Cross sectional analysis of the 2010 Nationwide Inpatient Sample (NIS)
- Statistical analysis accounting for sampling and weighting design of NIS
- Patient demographics and hospital based characteristics used as predictor variables
Results

<table>
<thead>
<tr>
<th></th>
<th>Non-Robotic</th>
<th>Robotic</th>
<th>p Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of Stay (days)</td>
<td>206</td>
<td>168</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total Charges</td>
<td>$34,140</td>
<td>$49,643</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Discussion

- Race, income, insurance status were not independent predictors of robotic versus non-robotic sacrocolpopexy
- Patient’s categorized as “other” race were less likely to undergo a robotic procedure than white women
- Hospital control was associated with the likelihood of undergoing a robotic procedure

Limitations

- Lack of unique ICD-9-CM procedure code for laparoscopic sacrocolpopexy
- Potential miscoding and misclassification

Conclusions

- Robotic assisted procedures make up small portion of total number of sacrocolpopexies
- The likelihood of a patient receiving a robotic assisted procedure is not predicated on most demographic and hospital factors
- Most patients undergoing sacrocolpopexy are not benefiting from a minimally invasive surgical approach

References

Methods

• Likert questionnaire used to question educators, residents, and physicians being proctored.

Categories for Residents and Surgeons
• Preferred single vs. dual console
• Case of understanding instructions in dual vs. single console
• Appreciation with procedure on dual vs. single console

Categories evaluated for educators
• Procedure on single vs. dual console for teaching
• Overall hardware environment preference on dual vs. single console

Materials

• Faculty who taught and proctored on both dual and single consoles
• Residents and surgeons who had trained on dual and single consoles.

Evolution of the da Vinci System

- Dual Console
- Enhanced HD Vision (1080i)
- Superior Ergonomics
- Increased Surgeon Control
- Scalable architecture
- Advanced instruments

- da Vinci Si
- 3D HD Vision (720p)
- Visual Debut - TilePro
- Multi-instrument access
- Streamlined set-up
- Procedure-specific and energy instruments

Limitations of Study

- Small sample size of residents, surgeons and educators
- 35 residents and proctored surgeons
- 4 educators
- No data to quantitate endpoint of proficiency on DaVinci surgical console

Disclosures

I have no financial relationships to disclose.
Challenge to Instructors

Safety take residents and surgeons to system proficiency

Integrative dual console

Real time hand controlled cursor

Direct course of dissection, pathology delineation, danger areas

Discussion

Safety of robotic training and certification has remained a major concern for residency programs and hospital credentialing committees.

Results

- 79% of respondents questioned base use tele-dual and single console.
- 1 instructor had instructed only on the dual console system.
- 100% of respondents found dual console superior to the single console for learning and education.
- No one found the single console superior to the dual console.
- 100% of respondents found instructors easier to follow on the dual console.
- 95% felt apprehension was reduced on dual console over single console.
- Nine respondents felt this was unclear between dual and single console.
- 100% of faculty felt dual console was preferred for teaching or practicing.
- 100% felt assisting on a dual console was valuable in developing robotic skills.
- 100% of respondents felt dual console provided an easier teaching environment.

Telestrator

- Draw a sketch of scissor position and angle rather then describe in terms of “internal rotation” and “flexion”.
- Telestrator
  a) Outline anatomy
  b) Safe zones of instrument excursion
  c) Ergonomic instrument positioning instruction
- Integrative Faculty Control Facilitated by Telestrator
  a) outlining anatomy (ureter, vessels, bowel)
  b) outlining “safe zones”
  c) illustrating ergonomic instrument positioning

Surgeon at console

Control Panel
Discussion

- Aviation safety models and criteria have often been cited in developing surgical training methods.
- Pilot training has traditionally used the model of didactic, simulation, and dual control for pilot instruction.

Conclusions

- Dual console robotic platforms provide tremendous teaching and training modalities as evidenced in this study contrasting single and dual console systems.
- These findings should assist programs or hospitals looking for the justification of the expense of a dual console system for educational purposes to enhance training for residents and physicians being proctored.

References

CULTURAL AND LINGUISTIC COMPETENCY

Governor Arnold Schwarzenegger signed into law AB 1195 (eff. 7/1/06) requiring local CME providers, such as the AAGL, to assist in enhancing the cultural and linguistic competency of California’s physicians (researchers and doctors without patient contact are exempt). This mandate follows the federal Civil Rights Act of 1964, Executive Order 13166 (2000) and the Dymally-Alatorre Bilingual Services Act (1973), all of which recognize, as confirmed by the US Census Bureau, that substantial numbers of patients possess limited English proficiency (LEP).

California Business & Professions Code §2190.1(c)(3) requires a review and explanation of the laws identified above so as to fulfill AAGL’s obligations pursuant to California law. Additional guidance is provided by the Institute for Medical Quality at http://www.imq.org.

Title VI of the Civil Rights Act of 1964 prohibits recipients of federal financial assistance from discriminating against or otherwise excluding individuals on the basis of race, color, or national origin in any of their activities. In 1974, the US Supreme Court recognized LEP individuals as potential victims of national origin discrimination. In all situations, federal agencies are required to assess the number or proportion of LEP individuals in the eligible service population, the frequency with which they come into contact with the program, the importance of the services, and the resources available to the recipient, including the mix of oral and written language services. Additional details may be found in the Department of Justice Policy Guidance Document: Enforcement of Title VI of the Civil Rights Act of 1964 http://www.usdoj.gov/crt/cor/pubs.htm.

Executive Order 13166, “Improving Access to Services for Persons with Limited English Proficiency”, signed by the President on August 11, 2000 http://www.usdoj.gov/crt/cor/13166.htm was the genesis of the Guidance Document mentioned above. The Executive Order requires all federal agencies, including those which provide federal financial assistance, to examine the services they provide, identify any need for services to LEP individuals, and develop and implement a system to provide those services so LEP persons can have meaningful access.

Dymally-Alatorre Bilingual Services Act (California Government Code §7290 et seq.) requires every California state agency which either provides information to, or has contact with, the public to provide bilingual interpreters as well as translated materials explaining those services whenever the local agency serves LEP members of a group whose numbers exceed 5% of the general population.

~

If you add staff to assist with LEP patients, confirm their translation skills, not just their language skills. A 2007 Northern California study from Sutter Health confirmed that being bilingual does not guarantee competence as a medical interpreter. http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2078538.