Surgical Tutorial 4: Surgical Challenges and Techniques in 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.

Accreditation
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Surgical Tutorial 4: Surgical Challenges and Techniques in Robotics

Iris K. Orbuch, Chair

Faculty: Douglas N. Brown, Nicole D. Fleming, Sami Kilic

This session provides a comprehensive approach to surgical challenges and techniques for experienced surgeons and those who are gaining experience in robotics. Topics include those we face on a daily basis, such as surgical obesity, multiple and broad ligament myomas, as well as others less often encountered, such as robotic sciatic nerve exposure. This session will include videos that will help illustrate approaches to various surgical challenges.

Learning Objective: At the conclusion of this course, the clinician will be able to: 1) Discuss how to tackle difficult surgical challenges in robotics.

Course Outline

11:00 Welcome, Introductions and Course Overview I.K. Orbuch
11:05 Surgical Challenges with Obesity N.D. Fleming
11:20 Surgical Challenges with Multiple Myomectomies and Broad Ligament Myomas D.N. Brown
11:35 Surgical Challenges with Robotic Sciatic Nerve Exposure S. Kilic
11:50 Questions & Answers All Faculty
12:00 Adjourn
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The following members of AAGL have been involved in the educational planning of this workshop and have no conflict of interest to disclose (in alphabetical order by last name).
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Iris K. Orbuch
Consultant: Intuitive Surgical

Asterisk (*) denotes no financial relationships to disclose.
Surgical Challenges with Obesity
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Disclosure Information
I have no financial relationships to disclose

Objectives
• Discuss Perioperative Risk Assessment and Intraoperative Surgical Considerations

Obesity and Postoperative Complications
• Univ of Michigan retrospective review
• 7,271 postop complications in 4 years
• Risks increased with obesity:
  – MI (p=0.001)
  – Peripheral nerve injury (p=0.04)
  – Wound infection (p=0.001)
  – UTI (p=0.004)
  – Mortality 2.2% vs. 1.2% (p=0.03)
  – Tracheal reintubation (p=0.009)
  – Cardiac arrest (p=0.02)


Changes Associated with Tredelenburg and Obesity
• Decreased FRC
  – Greater ventilation to perfusion mismatch
  – Hypercapnea
  – Acidosis
  – Treatment: Increase minute ventilation
    • Increase respiratory rate
    • Decrease tidal volume
  – Decreased venous return
  – Increased afterload
  – Increased CVP, ICP, PAP, MAP
  – Arrhythmias in up to 27%


Effects of Pneumoperitoneum in Morbidly Obese
• Higher intra-abdominal pressure at 2-3X that of non-obese (9-10 mm Hg vs. 3-5 mm Hg)
  – Venous stasis
  – Decreased portal blood flow (↑ LFTs)
  – Decreased intraop urinary output (↓ 30-60%)
  – Lower respiratory compliance
  – Increased airway pressure
  – Impaired cardiac function

**Effects of Pneumoperitoneum in Morbidly Obese**

- *Intraoperative management*
  - Avoid hypercapnia and acidosis
  - ETCO2 increases 12% → PaCO2 increases 10%
  - Increase minute ventilation 21%
  - CO2 primarily eliminated through lungs
  - Overall absorption/excretion CO2 similar in obese and non-obese
  - Use SCDs to minimize venous stasis
  - Optimize intravascular volume to minimize effects increased intra-abdominal pressure on renal and cardiac function

**VTE Risk in Obese**

- Pneumoperitoneum decreases femoral venous flow by 30-40%
- Reversed by SCDs but **NOT** in obese
- Risk is 1% for DVT and 0.9% for PE in 668 obese patients
  - **GOG LAP2 study:** 2% risk VTE in each arm
  - Most VTE’s are diagnosed >1 week postop
  - Risk factors for clinical VTE: age>60, cancer, prior VTE, prolonged surgery or bedrest

**High-risk factors for VTE in MIS**

- 573 cases MIS cases for endometrial cancer
- SCDs in all patients; 22% postop LMWH
- **Overall VTE rate:** 1.2%
  - **High-risk group VTE rate:** 9.5% (vs. 0.6% without high-risk factors)
    - BMI > 40
    - OR time ≥ 180 min

**VTE Risk in MIS for Gynecologic Oncology Patients**

- 352 patients undergoing MIS for Gyn cancer
- NO thromboprophylaxis (heparin or SCDs)
- 2/352 (0.57%) had VTE (1 DVT, 1 PE)
- Similar findings in MIS for prostate cancer: rate VTE 0.5% without heparin-based thromboprophylaxis
- **Risks associated with routine perioperative anticoagulant prophylaxis:**
  - Increased intraop bleeding (p<.001), transfusion rates (p=0.03), reoperation rates (p=0.01), hospital stay p<0.001

**LMWH Dosing Modifications in Obese**

- **Dalteparin:** Increase dose by 30% if BMI > 40kg/m²
- **Enoxaparin:**
  - BMI 30-39kg/m²: 30mg q12h
  - BMI >40kg/m²: 40mg q12h
  - BMI >50kg/m²: 60mg q12h

**Surgical infections and Obese**

- NSQIP database on colon resections for cancer (3200 pts at over 120 hospitals)
- More complications in morbidly obese
  - Overall 32% vs. 20%
  - Surgical site infection 21% vs. 9%
  - Dehiscence 3.3% vs. 1.1%
  - PE 1.3% vs. 0.3%
**Antibiotic Prophylaxis**

- Must have adequate blood and tissue levels of antibiotic during entire surgery
  - Obesity reduces tissue levels
  - Increasing volume of distribution
- Initiate antibiotic prophylaxis within 1 hour of incision time
- Re-dose if EBL > 1500mL
- Re-dose if surgery continues more than 2 half-lives after first antibiotic dose

**Preoperative Evaluation**

- Anesthesia consult
- Optimization prior to surgery
  - Weight loss
  - Glycemic control
  - Tobacco cessation
  - Discontinuation of any hormonal agents at least 4 weeks prior

**Preoperative Surgical Modifications for Obese**

- **Equipment**
  - Table that can accommodate patient size
  - May need side attachments to bed
  - Stirrups that can accommodate patient leg size
  - Foam cushioning
- **Additional personnel**
  - Anesthesia
  - Surgical and nursing teams

**Pre-oxygenation is best at 25° elevation of head**

- RCT of angled vs. supine induction of anesthesia in 42 pts undergoing L/S gastric band—all with BMI > 40
- 25° head up position achieved **23% higher oxygen tension**
- Increase in desaturation safety period—greater time for intubation and airway control

**Patient positioning**

- Morbidly obese patients at higher risk of injuries (especially **peripheral nerve injury**)
- Secure patient to table
  - Ensure no position change when move table
  - Padded strap on upper chest to secure patient
- May need bean bag, shoulder blocks, or egg crates to preventing shifting of patient
- Padding of pressure points

**Now you have the patient intubated...**

- Positioning on the OR table
- Trocar placement
- Troubleshooting visualization during the case
Patient positioning

- Avoiding brachial plexus injuries
  - Shoulders and arms should be level
  - Avoid arms dropping below mid-axillary line
  - Avoid midline shoulder rolls

Trocar placement

Normal anatomic landmarks are absent in obese patients

Trocar insertion methods

- Veress needle
  - Intraperitoneal pressure <10mmHg
- Open laparoscopy
  - May lower risk of major vascular injury
- Direct trocar insertion
  - Radially expanding or optical trocars
- LUQ insertion (Palmer’s point)
  - Midclavicular line
  - At least 3cm below left subcostal margin
  - Stomach decompressed with orogastric tube
  - Direction of insertion 45° to 90° depending on body weight of patient

Adjustments in obesity

- Extra long trocars (**Caution with trocar insertion**)
- Balloon-tipped trocars (for assistant and camera)
- Beware of torquing or angling of trocar
- Endoclose method (i.e. Carter Thomason®, Cooper Surgical) for fascial closure
Adjustments in obesity

- Pannus location in relation to pubic symphysis
- Standard measurements for robotic trocars do not apply
- LUQ insertion
  - Safer
  - Less adipose

Troubleshooting visualization in obesity

- Maintaining adequate pneumoperitoneum
  - Aim for 15-18 mmHg with traditional system
  - Can use lower pressures with newer insufflation systems (AirSeal®, SurgiQuest)
- Use ALL robotic arms AND put in enough assistant ports
- Tack rectosigmoid epiploica to left lateral peritoneum
- Use of fan retractors

Obese with 15wk size uterus—Hyst, BSO, PPALND, mini-lap

- Mini-lap for specimen removal
- Home POD#1, no complications

Risk of conversion to open

- 280 pts undergoing MIS for uterine hyperplasia/cancer at Duke and UVA with BMI > 30 kg/m²
- 235/280 converted to open (16%)
- Higher BMI in those converted to open:
  - BMI 47 vs. 41 kg/m² (p<.001)
- Patients with BMI > 60 kg/m²
  - 39% conversion rate
  - 14% rate supracervical hysterectomies
Take Home Points

- Be prepared for surgery **BEFORE** going into operating room
- Discuss case with anesthesia before case
- Be aware of surgical adjustments for obese patients
- Make adequate use of robotic arms and assistant ports
  – **True benefit of the robotic system!**

Thank you!

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Surgical Challenges with Multiple Myomectomies and Broad Ligament Myomas

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• Consultant for Covidien

OBJECTIVES

• Explain the basic pre-operative evaluation and management of patients with symptomatic fibroids presenting for surgical consultation.
• Describe appropriate minimally invasive surgical techniques utilized in the approach to multi- and broad ligament fibroid robotic myomectomy.
• Apply the knowledge learned to increase patient safety, surgical efficiency, and outcomes in robotic myomectomy.

Uterine Leiomyomas

• Most common benign pelvic tumor
• Lifetime prevalence 20-80%
• 20-30% of women > 35 y/o have at least one myoma
• Presenting symptoms:
  ▪ Bleeding
  ▪ Pain
  ▪ Pressure
  ▪ Infertility

Treatment options:
• Observation
• Medical Therapy
• UAE
• MRgFUS, RFVTA
• Myomectomy
• Hysterectomy
Operating Room Preparation

- Vasopressin
  - 20 Units in 60cc normal saline
  - Cochrane Database:
    - EBL during myomectomy with vasopressin is significantly less than placebo (300 mL less) and comparable to a uterine artery tourniquet
    - The half-life is 10 to 20 minutes
    - Duration of action is 2 to 6 hours

Kongnyuy EJ, Wissoung C. Interventions to reduce haemorrhage during myomectomy for fibroids. Cochrane Database Syst Rev 2011; :CD005355

Operating Room Preparation

- Consider having in the room…
  - An adhesion barrier
    - Interceed, Seprofilm
  - A hemostatic agent
    - Floseat, Tisseal, Evicel

Case Presentation

- 35 y/o G0 with increasing pelvic pain, increasing urinary frequency, and heavy painful periods over the last 6-12 months – desires future fertility
- Primary OB/GYN:
  - Exam consistent with enlarged uterus (18-20 wks globular)
  - No past medical or surgical hx, Pap, EMBX – WNL’s
  - MRI:
    - Enlarged fibroid uterus - posterior uterine body, measuring 9.3 x 8.5 cm.
    - An anterior left subserosal fibroid measures 5.2 x 7.5 cm. Several smaller subserosal fibroids. ENDOMETRIUM: Anteriorly displaced by fibroids, measures up to 6 mm.

Robotic Multiple Myomectomy

Left Broad Ligament
Post-Operative Care

• Hospital:
  • Toradol 30 mg IV Q 6 hrs x 3 doses (First dose in OR)
  • Dilaudid IV for breakthrough pain
  • Colace 100 mg po bid
  • Simethicone 160 mg po q 4 hrs
  • Foley until ambulatory
  • Regular diet, SCD’s until ambulatory
  • Discharge same day or POD #1

• Outpatient:
  • Motrin 600 mg po q 6 hrs x 5 days, Colace 100 mg po bid x 5 days
  • Simethicone 160 mg po q 4 hrs x 5 days, Oxycodone 5 mg po q 4 hrs pm

Follow-Up Apt:
  1) 2 weeks
  2) 6 weeks

REFERENCES

• Semm, K. New methods of pelviscopy (gynecologic laparoscopy) for myomectomy, ovariectomy, tubectomy and adnexectomy. Endoscopy. 1979; 11: 85–93

Thank You!
Objective: Adaptation of robot assistance to retroperitoneal nerve exposure.

Design: Stepwise demonstration of the technique with narrated video footage.

Setting: Surgical challenges and techniques in robotics for retroperitoneal nerve exposure for deep infiltrative endometriosis, neural pelvic pain.

Interventions: Incision has been made lateral to external iliac vessels to reach lumbosacral space. Dissection carried out between external iliac vessels and psoas muscle. For safety stay close to psoas muscle as you are traveling deeper. At this stage in order to keep the visualization optimized, be careful small collateral vessels. Do not remove lymph nodes or avoid transect lymph channels as much as possible as you are mobilizing of the nodes-fatty tissue from internal obturator muscle. This will secure the exposure of the obturator nerve. If end target is sciatic nerve, which will be caudal, border of the piriformis muscle. Caudal of the sciatic will identify the pudendal nerve.

Conclusion: Adapting Robot assisted approach is feasible for retroperitoneal nerve exposure using shortest and least invasive technique described as LANN (Laparoscopic Neuro-Navigation) technique.
Surgical Challenges with Robotic Sciatic Nerve Exposure

Sami Gokhan KILIC, MD, FACOG, FACS
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Director of Minimally Invasive Gynecologic Surgery. Urogynecology

I have no financial relationships to disclose

Objective

• Discuss whether robot-assisted approach provides adequate surgical exposure to identify retroperitoneal nerves’ exposure

Which surgical conditions can create more challenges during surgery?

• Patient with deep infiltrating endometriosis
• Patient who needs a radical surgery
• Status post radiotherapy
• Status post sacrospinous fixation
• Patients with neural pelvic pain

Review of endometriosis

• 96 articles searched:
• 83 articles: 365 cases of EM surrounding somatic peripheral nervous and 13 cases of EM surrounding central nervous
  Lumbo-sacral and sacral plexus: 57%
  Sciatic nerve: 39%

Patient presentation

• 26yo G0P0 lady presented to local Gynecologist with cyclic subtle gait disturbances, dyspareunia. Diagnostic LS R pelvic wall blue 1 cm lesion, MRI is not conclusive for the depth of it. Referred to UTMB for further surgical options.
Surgical technique

• **An incision:** on the pararectal peritoneum lateral to the external iliac artery

• **Blunt dissection:** expanding of the incision toward the lumbo-sacral space (latero-caudad direction) along the psoas major or lateral to the external iliac vessels

• **1st identification:** exposing the lumbo-sacral trunk and the proximal portion of the obturator nerve.

Mobilization of the lymph–fatty tissue from the internal obturator muscle: do not remove lymph nodes or transect lymph channels

• **2nd identification:** the sciatic nerve is seen under the caudal border of the piriformis muscle

• **3rd identification:** the dissection of the caudal portion of sciatic nerve’s capsule provide us to expose the **pudendal nerve.**

Obturator nerve: L2, L3, and L4

- the largest nerve originated from anterior divisions of the lumbar plexus
- descending along medial of the iliopsoas muscle
- lying lateral to the ureter and under the internal iliac vessels
- then traversing the obturator foramen into the medial thigh, under the superior pubic ramus, dividing into anterior and posterior branches.

The sciatic nerve: L4, L5, S1, S2, and S3

- formed at the junction of the lumbar sacral plexus
- emerging from the pelvis through the greater sciatic notch inferior to the piriformis muscle
- entering the thigh lateral to the ischial tuberosity
- accompanied by the inferior gluteal artery

  **Distally,** the nerve should be identified at the greater sciatic notch

  **Proximally,** it should be identified below the psoas muscle

Pudendal nerve: S2, S3, S4

- leaving the pelvis through the greater ischiatic foramen
- surrounding the ischial spine under the sacrospinous ligament
- entering the perineum through the lesser sciatic foramen
- accompanied by the pudendal artery and vein
- traveling in the ischio-anal fossa called Alcock’s canal

Sami G. Kilic, MD, FACOG, FACS

University of Texas Medical Branch
Director of MIS

• Thank you for your attention

• More information [www.theison.org](http://www.theison.org)

• ISON: International Society of Neuropelveology
References


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Conclusion:

- Adapting Robot assisted approach is feasible for retroperitoneal nerve exposure using shortest and least invasive technique described as LANN (Laparoscopic Neuro-Navigation) technique.
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.