Didactic: Pushing the Surgical Envelope:
The Methods to Our Madness

PROGRAM CHAIR
Ted T.M. Lee, MD

Hye Chun Hur, MD, MPH  Alan M. Lam, MD  Audrey T. Tsunoda, MD, Ph.D.
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
AAGL is accredited by the Accreditation Council for Continuing Medical Education to provide continuing medical education for physicians.

The AAGL designates this live activity for a maximum of 3.75 AMA PRA Category 1 Credit(s)™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

DISCLOSURE OF RELEVANT FINANCIAL RELATIONSHIPS
As a provider accredited by the Accreditation Council for Continuing Medical Education, AAGL must ensure balance, independence, and objectivity in all CME activities to promote improvements in health care and not proprietary interests of a commercial interest. The provider controls all decisions related to identification of CME needs, determination of educational objectives, selection and presentation of content, selection of all persons and organizations that will be in a position to control the content, selection of educational methods, and evaluation of the activity. Course chairs, planning committee members, presenters, authors, moderators, panel members, and others in a position to control the content of this activity are required to disclose relevant financial relationships with commercial interests related to the subject matter of this educational activity. Learners are able to assess the potential for commercial bias in information when complete disclosure, resolution of conflicts of interest, and acknowledgment of commercial support are provided prior to the activity. Informed learners are the final safeguards in assuring that a CME activity is independent from commercial support. We believe this mechanism contributes to the transparency and accountability of CME.
## Table of Contents

Course Description .............................................................................................................................. 1

Disclosure ........................................................................................................................................... 3

Access and Exposure  
H-C Hur ............................................................................................................................................. 4

Ureter Techniques in Identification, Dissection and Uretolysis  
A.M. Lam ........................................................................................................................................... 10

Prevention and Management of Surgical Bleeding in Gynecology  
A.T. Tsunoda ........................................................................................................................................ 13

Methodical Approach to the Obliterated Cul-de-Sac Aftermath or Prior Cesarian Section  
T.T.M. Lee ............................................................................................................................................ 21

Location Is Everything – The Challenges of Broad Ligament and Cervical Fibroid  
A.T. Tsunoda ....................................................................................................................................... 25

Laparoscopic Detection and Repair of GI and GU Injuries – A Game Changer  
A.M. Lam ............................................................................................................................................... 29

Unfreeze the Frozen Pelvis – Hysterectomy for Severe Endometriosis with Obliteration of Cul-de-Sac  
T.T.M. Lee ............................................................................................................................................ 34

Cultural and Linguistics Competency ................................................................................................. 39
As gynecologic surgeons mature in experience and skill, few will leave their comfort zone and push the surgical envelope to take on challenges. Those who push the surgical envelope with sheer bravado alone risk failure and infamy. Surgeons who do succeed are those who adopt a methodical and systematic approach. Anatomy and exposure are frequently cited as the foundations of pelvic surgery. True mastery occurs in those who develop the ability to quickly formulate various strategic plans when confronted with anticipated as well as unexpected surgical difficulties.

There is certainly no shortage of challenging pathologies to push the surgical envelope in laparoscopic surgery. The obliterated anterior cul-de-sac from previous cesarean deliveries, or a frozen pelvis as a result of advanced endometriosis can both present very perplexing clinical quandaries. Likewise, broad ligament or cervical fibroids and ovarian remnants can present different types of challenges. Refining the skills to repair visceral injuries and control hemorrhage laparoscopically will help surgeons to minimize morbidities and decrease conversions to laparotomy.

This course will present these techniques through the use of surgical video, which will illustrate strategies to overcome the difficulties associated with various anatomy distorting pathologies. Participants will develop a greater understanding of safe and effective approaches to the challenging surgical scenarios through lectures that are both evidence- and experience-based.

Learning Objectives: At the conclusion of this course, the clinician will be able to: 1) Articulate techniques to achieve peritoneal access in patients with extensive anterior abdominal wall adhesions as well as techniques necessary to overcome difficulties associated with laparoscopy in obese patients; 2) formulate anatomy-based strategies when confronting various challenging surgical scenarios such as frozen pelvis, cervical fibroid and dense uterine adhesions; 3) apply the principle behind the techniques in the identification, dissection of ureter and difficult uretolyis; 4) integrate various techniques to optimize exposure during complex pelvic surgeries, and 5) discuss how to incorporate the techniques of detection and repair of visceral injuries in laparoscopy.

Course Outline

<table>
<thead>
<tr>
<th>Time</th>
<th>Session Title</th>
<th>Speaker(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>12:30</td>
<td>Welcome, Introductions and Course Overview</td>
<td>T.T.M. Lee</td>
</tr>
<tr>
<td>12:35</td>
<td>Troubleshooting Approaches for Challenging, Peritoneal Access: Obesity and Abdominal Wall Adhesions, Mesh, etc.</td>
<td>H-C Hur</td>
</tr>
<tr>
<td>12:55</td>
<td>Optimizing Exposure in Challenging Surgical Scenarios in Gynecologic Laparoscopy</td>
<td>H-C Hur</td>
</tr>
<tr>
<td>1:15</td>
<td>Ureter Techniques in Identification, Dissection and Uretolysis</td>
<td>A.M. Lam</td>
</tr>
<tr>
<td>1:35</td>
<td>Prevention and Management of Surgical Bleeding in Gynecology</td>
<td>A.T. Tsunoda</td>
</tr>
<tr>
<td>1:55</td>
<td>Break</td>
<td></td>
</tr>
<tr>
<td>2:15</td>
<td>Interactive Case Video Presentation 1</td>
<td>A.M. Lam, H-C Hur</td>
</tr>
<tr>
<td></td>
<td>Moderated by A.T. Tsunoda, T.T.M. Lee</td>
<td></td>
</tr>
</tbody>
</table>
2:35   Methodical Approach to the Obliterated Cul-de-Sac Aftermath or Prior Cesarian Section  
       T.T.M. Lee

2:55   Location Is Everything – The Challenges of Broad Ligament and Cervical Fibroid  
       A.T. Tsunoda

3:15   Laparoscopic Detection and Repair of GI and GU Injuries – A Game Changer  
       A.M. Lam

3:35   Unfreeze the Frozen Pelvis Hysterectomy for Severe Endometriosis with Obliteration of Cul-de-Sac  
       T.T.M. Lee

3:55   Interactive Case Presentation 2  
       T.T.M. Lee, A.T. Tsunoda

3:55   Moderated by A.M. Lam, H-C Hur

4:15   Questions & Answers  
       All Faculty

4:30   Adjourn
PLANNER DISCLOSURE
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).
Art Arellano, Professional Education Manager, AAGL*
Amber Bradshaw
Erica Dun*
Frank D. Loffer, Medical Director, AAGL*
Linda Michels, Executive Director, AAGL*
Johnny Yi*

SCIENTIFIC PROGRAM COMMITTEE
Arnold P. Advincula
Consultant: Intuitive
Royalty: CooperSurgical
Sarah L. Cohen*
Jon I. Einarsson*
Stuart Hart
Consultant: Covidien
Speakers Bureau: Boston Scientific, Covidien
Kimberly A. Kho
Contracted/Research: Applied Medical
Other: Pivotal Protocol Advisor: Actamax
Matthew T. Siedhoff
Other: Payment for Training Sales Representatives: Teleflex
M. Jonathon Solnik
Consultant: Z Microsystems
Other: Faculty for PACE Surgical Courses: Covidien

FACULTY DISCLOSURE
The following have agreed to provide verbal disclosure of their relationships prior to their presentations. They have also agreed to support their presentations and clinical recommendations with the “best available evidence” from medical literature (in alphabetical order by last name).
Hye-Chun Hur
Royalty: UpToDate
Alan M. Lam
Other: Fellowship Support: Stryker Endoscopy
Ted T.M. Lee
Consultant: Ethicon Endo-Surgery
Audrey T. Tsunoda*

Asterisk (*) denotes no financial relationships to disclose.
Access and Exposure

Hye-Chun Hur, MD, MPH
Associate Professor, Harvard Medical School
Director, Division of Minimally Invasive Gynecologic Surgery
Beth Israel Deaconess Medical Center, Boston, MA

Disclosures
Royalty:
UpToDate

Objectives
• Discuss why mastering safe access is essential
• Articulate debate between open vs closed entry
• Review specific clinical scenarios that may seem daunting to the GYN surgeon
• Optimize safe access and exposure to “push the surgical envelope”
  o Tips and tricks
  o Video demos

Importance of Peritoneal Access

Why is safe peritoneal access essential?

➢ overall incidence of laparoscopy-related complications is low ~1% 1-4
➢ > 50% of injuries in laparoscopic surgery occur during initial abdominal entry 1-4

Inherent Risks of Peritoneal Access

• 50% of the injuries are bowel injuries
• 10% are major vessel injuries 1-4

➢ No trendelenburg during initial entry.

Debate: Open vs Closed Entry

Does it matter how you enter?

• Open Entry (Hasson) ➔ same bowel risk (& vascular) 5
• Closed Entry (Veress) ➔ greater risk of failed entry and minor injuries (emphysema, omental injury) 1-4

Recommend using the technique you are good at (doing what you are good at typically = least risk)
**Entry**

- Closed Entry (Veress needle +/- Optical trocar)
- Open entry (Hasson)
  - Not completely blind
  - Tag fascia on entry

**Risk**

- Type of entry (closed vs open technique) does not change risk for experienced surgeons
- Increase Risk:
  - Obesity
  - Prior surgeries
  - Hernia repairs with mesh
  - Large abdominal-pelvic masses

**Objectives**

- Why mastering safe access is essential
- Debate between open vs closed entry
- Review specific clinical scenarios that can seem daunting to the GYN surgeon
- How to achieve safe access and exposure to “push the surgical envelope”
  - Tips and tricks
  - Video demos

**Clinical Scenarios**

<table>
<thead>
<tr>
<th>Anatomic Challenges</th>
<th>Abdominal Wall Challenges</th>
<th>Intraperitoneal Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obesity</td>
<td>Abdominoplasty</td>
<td>Multiple prior surgeries</td>
</tr>
<tr>
<td>Pregnancy</td>
<td>Hernias +/- mesh repair</td>
<td>Extensive adhesions (eg. inflammatory or infectious)</td>
</tr>
</tbody>
</table>

**Obesity: Anatomic Challenge**

- Difficult peritoneal access
- Difficult intraperitoneal maneuverability

**Obesity: Access Challenge**

- Technique, entry
  - Open: Hasson (direct visualization)
  - Closed: Veress needle (blind entry)
  - Optical trocar (visual entry)
  - Versastep needle (hybrid entry)
- Location, entry
  - Intra-umbilical entry is key
  - Narrowest portion of abdominal wall
  - Most maneuverability
  - Best access to umb fascia (guaranteed closure)
Obesity: Maneuverability Challenge

- Trocars
  - Extra long vs balloon tip trocars (slippage)
  - Perpendicular entry (maneuverability)
- Arm Tuck
  - Toboggans → closer to bed, but less anterior abdominal wall maneuverability
  - Arm boards → farther from bed, but more anterior abdominal wall maneuverability

Arm Boards
- Toboggans
  - Closer to bed, but less anterior abdominal wall maneuverability
- Arm boards
  - Farther from bed, but more anterior abdominal wall maneuverability

Obesity Maneuverability

Pregnancy

- Pregnancy = transient truncal obesity
- Intraperitoneal access is challenging for diff reasons
  - Abdominal wall anatomy is unchanged
  - Risk to underlying gravid uterus → open entry
  - Intraperitoneal maneuverability is the greater challenge (crowding) → careful port placement
- Constantly work on maintaining safe exposure
  - 30 degree camera
  - Bipolar devices (avoid fetus in monopolar circuit)
  - No uterine manipulators

- IUP @ 17w 2d → LSC LSO (torsion)
- Presents with nausea, vomiting, LLQ pain
- PUS: 9.6 cm L adnexal mass with 2.4 cm avascular mural nodule & 5.2 cm vascular solid component
- MRI: enlarged 10 cm L adnexa with 5.4 cm solid component
- Video

Clinical Scenarios

- Anatomic Challenges
  - Obesity
  - Pregnancy
- Abdominal Wall Challenges
  - Abdominoplasty
  - Hernias +/- mesh repairs
- Intraperitoneal Challenges
  - Multiple prior surgeries
  - Extensive adhesions

Abdominoplasty

- Big incision, little impact

Video
Hernias

Different Types of Hernias (risk at primary entry)
- Inguinal: occurs in the inner groin (no risk)
- Femoral: upper thigh/outer groin (no risk)
- Incisional: through an incision or scar (at risk)
- Ventral: occurs in abdominal wall (abdominal mapping)
- Umbilical: occurs at belly button (direct vs alternate entry)
- Hiatal: occurs inside the abdomen, along the upper stomach/diaphragm (no risk)

Hernia Repair with Mesh

46yo nulliparous female
- Obese (BMI 36.6)
- Insulin dependent diabetes
- Hypertension
- Hypercholesterolemia
- Metabolic syndrome
- Chlamydia, genital herpes
- Right adnexal cyst

Ventral and Umbilical hernia repair with mesh

Abdominal Wall Mapping

- Assess hernia anatomy (hernia location)
- Assess mesh (size)
- Pre-operative imaging (CT scan)
- Operative report
Abdominal Wall Mapping

- Abdominal wall pathology dictates initial entry
- RUQ entry (open technique)

Hernia Repair with Mesh

- Abdominal wall pathology dictates initial entry
- RUQ entry (open technique)

Implants

- Implants that use electric current
  - Pacemakers (most life threatening risk)
  - Port placement (chemotherapy)
  - Spinal cord stimulator (chronic pain)
  - Gastric neurostimulators (gastroparesis)
  - Insulin pump (diabetics)

  ➔ Use bipolar or harmonic devices when possible
  ➔ For monopolar current, strategically place return electrode pad so implant is not part of electric circuit

Clinical Scenarios

- Anatomic Challenges
  - Obesity
  - Pregnancy
- Abdominal Wall Challenges
  - Abdominoplasty
  - Hernias +/- mesh repairs
- Intraperitoneal Challenges
  - Multiple prior surgeries
  - Extensive adhesions

Intraperitoneal Challenges

- Extensive adhesions
  - Multiple prior surgeries (63-93%) 9, 10
  - Prior infections
    - PID
    - Diverticulitis
    - Abscess
  - Inflammatory conditions
    - Gyn causes: Endometriosis
    - Non-Gyn causes: IBD
Exposure

Value of GOOD exposure

- Uterine manipulator (stage 4 endo)
- 30 degree laparoscope (pregnancy, large masses)
- Cephalad port placement (large masses)
- Suture ovary (pelvic sidewall exposure)
- Suture bowel (post cul de sac exposure)
- EEA sizer (identify rectum & bowel anatomy)
- Myomectomy at time of TLH for exposure & access
  - cervical myomectomy before TLH,
  - broad ligament myomectomy before TLH

Exposure Essentials (Videos)

- Use entry technique that is most familiar to you for initial intraperitoneal access
  - Deviate for exceptions (eg abdominal wall mapping for patients with hernia repairs with mesh)
- Place ports cephalad to pathology (ie above site of dissection) for ergonomic access
- Use angled scope to improve visual access
- Always insert a uterine manipulator to optimize exposure

Take Home Points

- Always let the anatomy guide you

Questions?

Ureter: Techniques in Identification, Dissection and Ureterolysis

Alan Lam
Associated Professor
Centre for Advanced Reproductive Endosurgery (CARE)
Sydney Medical School, Australia

Disclosure

• Other: Fellowship
• Support: Stryker Endoscopy

Objective

• Discuss techniques in identifying and dissecting the ureter

Additional areas covered

• Gain thorough knowledge of pelvic and ureteral anatomy
• Beware of the sites where ureter is most susceptible to injury
• Be cognisant of conditions which increase ureteral risk
• Demonstrate surgical principles of ureteral dissection and ureterolysis
• Be familiar with clinical presentation of ureteral injuries
• Learn to manage ureteral injuries sustained during pelvic surgery
• Ultimate goal = prevention and appropriate management of ureteral injuries

Introduction

• Ureteral injury is not uncommon in pelvic surgery
• 75% of all ureteral injuries occur during gynecologic surgery, the majority during abdominal procedures
• Incidence of ureteric injury:
  - 0.1 – 7.6%
• Why injury to the urinary tract is an inherent risk of pelvic surgery:
  - The ureter traverses the pelvic cavity from the pelvic brim to the bladder
  - It lies in the retroperitoneal space
  - Its course can be distorted by pathologies, past surgeries, irradiation
  - Congenital anomalies are unexpected
• To prevent ureteral injuries, the surgeon must have a thorough knowledge of the location of the ureter during various pelvic procedures and the specific regions where it is most susceptible to injury

Frober R. Surgical anatomy of the ureter. 2007 BJI International

Anatomy of ureter

In adults the ureter is:
• Retropitoneal tube
• 25–30 cm long,
• with a diameter of 1.5–6 mm
The ureter is divided into:
• the abdominal,
• the pelvic
• the intramural segment
The abdominal segment of the ureter

- Extends from the renal pelvis to the pelvic brim.
- The right ureter begins behind the descending part of the duodenum.
- Just below its origin the ureters are crossed by ovarian vessels.
- In the male the right ureter remains on the posterior border of the bladder, and the left ureter is crossed by the round ligament and vaginal vessels.
- On the left side, the gonadal vessels and veins are embedded in the peripelvic fat pad in front of the left ureteral vessel.
- Just above the entry to the pelvis, the ureter is still covered by parietal peritoneum in the course of the ureteric vessels.
- Next to the ureteric fold, the gonadal vessels form an adjacent fold in females, thickening pelvic or suspensory ligament.
- The right ureter enters the pelvis by crossing over the right round ligament on the right side and the left ureter passes over the common iliac artery.

The pelvic segment of the ureter

- The pelvic segment of the ureter is ~15 cm long and accounts for roughly half of its total length.
- At the pelvic inlet, it crosses the common iliac vessels near their bifurcation.
- It then courses posterior to the ovary.
- In the paravesical, it runs in a convex curve and crosses the uterine vessels in a sagittal direction near, i.e. 1.5–2 cm (occasionally from 2 to 4 cm) away from the margin of the uterine sulcus.
- It then runs forward, accompanied by the neurovascular bundle of the bladder towards the bladder base to form the arch of vaginal folds before entering the bladder.
- The intramural segment of the ureter runs obliquely through the bladder wall:

The intramural segment of the ureter with the bladder wall

- The intramural segment of the ureter runs obliquely through the bladder wall.
- Near the bladder the terminal ureter is enveloped by the muscular layer of the bladder. It coalesces with bundles of the detrusor muscle in the bladder wall and consists of coarser longitudinally arranged muscle bundles.
- Reflux of urine is prevented because the ureter passes diagonally through the bladder wall mucosa for a short distance before entering the bladder lumen. The length of this intramural part of the ureter in adults is 1.2–2.5 cm.

Ureteral blood supply

1. Renal arteries
2. Ovarian/uterine arteries
3. Aorta
4. Common iliac arteries
5. Internal iliac arteries

- In the abdomen, the ureter derives its blood supply from small arteries approaching it medially, whereas the pelvic ureter receives its blood supply from vessels approaching laterally.

Ureteral wall

1. Mucosa
2. Muscle coat
3. Adventitia
4. Mesoureter
5. Supplying artery and vein
6. Adventitial vascular plexus
7. Perforating arteries
8. Muscular vascular plexus

Congenital anomalies of the ureter

The incidence of a ureteric reduplication is 1 : 100.

a: complete reduplication on one side
b: unilateral crossed ureter;
c: unilateral incomplete reduplication of the ureter.
Mechanisms of ureteral injuries
- Ligation
- Angulation
- Transsection
- Laceration
- Crush
- Ischemia
- Reaction

Sites of ureteric injuries
1. at the pelvic brim
2. near the infundibulopelvic ligament
3. pelvic sidewall: ovarian fossa
4. Ureretic tunnel under uterine artery
5. lateral to uteruscal ligament
6. at the vaginal fornix.

Pre-operative prediction of ureteric injury risk
- The majority of patients with ureteral injuries have no identifiable predisposing risk factors.
- Conditions which increase risk to the ureter:
  - Malignancy
  - Endometriosis
  - Pelvic adhesions
  - Enlarged uterus
  - Cervical and broad ligament fibroids
  - Intra-operative haemorrhage
  - Congenital anomalies

Principles of ureteric dissection and ureterolysis
- On the left side, mobilise recto-sigmoid attachments
- Identify the infundibulo-pelvic and ureteric folds at the pelvic brim
- Open the peritoneum lateral to the infundibulopelvic ligament
- Identify the ureter on the medial leaf of the peritoneum (the first surgical layer of the pelvis)
- Follow the ureter toward the cardinal ligament till it passes under the uterine artery
- Ensure the ureter is separated from the uterine ligament
- Trace the ureter until it enters the bladder wall
- Distinguish the ureter from other vascular structures by seeing the typical peristalsis on gentle stroking

Pre-operative measures to reduce ureteral risk
- Preoperative IVs do not decrease the incidence of ureteral injuries.
- 
- Attention to the anatomic course of the ureter during pelvic surgery is more effective in preventing injury than preoperative intravenous pyelograms (IVP) or ureteral stent placements
- 
- Prophylactic placement of ureteric stents (Level 1 evidence): no difference in ureteral injury rates during major gynecologic surgery with the use of prophylactic stenting.
- Use other surgical, interventional-operators, four lumina/externally spiga
- Identify adhesions to fat, serosa
- Lighted ureteric stents

Sites of ureteric injuries
- Preoperative IVPs do not decrease the incidence of ureteral injuries.
- 
- Attention to the anatomic course of the ureter during pelvic surgery is more effective in preventing injury than preoperative intravenous pyelograms (IVP) or ureteral stent placements
- 
- Prophylactic placement of ureteric stents (Level 1 evidence): no difference in ureteral injury rates during major gynecologic surgery with the use of prophylactic stenting.
Prevention and Management of Surgical Bleeding in Gynecology

Audrey T Tsunoda, MD, PhD
Hospital Erasto Gaertner – Curitiba/Brazil

Disclosures
I have no financial relationships to disclose

Objectives
• Recommend a routine
• Identify risky situations
• Recognize severity of vascular injuries and applicable resources for each situation
• Select the best resource for each type of vascular injury

Routine
Establish a minimum standard for:
• Patient selection and positioning
• Instruments and resources in the room
• Team positioning and individual role
• Anesthetists partners

Patient and Team Positioning

PELVIC APPROACH

Para-aortic APPROACH
Vascular lesions
When do they occur?
- Setup
- Dissection
- Adhesiolysis or resection
- Final moments

First access
- 76.5% of the major vascular injuries (*umbilical)
- 23.5% occur during dissection
- 2nd operative death cause
  (1st are anesthetic complications)
  Chapron J Am Coll Surg 1997

First access
Trocar direct entry
- Aortic bifurcation
- Iliac vessels

Veress needle
- Needle direction depends on the BMI
- Epigastric vessels

Watch out the excessive strengh to enter the peritoneal cavity...

Veress needle

Graph:

<table>
<thead>
<tr>
<th></th>
<th>Open Direct entry</th>
<th>Closed Veress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failure</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Intestinal and vascular injuries</td>
<td>=</td>
<td>=</td>
</tr>
<tr>
<td>Pre peritoneal space insufflation</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Omental injury</td>
<td>-</td>
<td>+</td>
</tr>
</tbody>
</table>

Ahmad Cochrane Database Syst Rev 2012
Distance between umbilical site and great vessels

IBMI<25  BMI 25-30  BMI>30

What should be done when facing a vascular injury during a first entry?

First: Recognize as soon as possible!!!
Always remember to review the abdominal cavity at the beginning and at the end of the procedure

**Special attention to expanding hematoma and signs of reduction of the peritoneal space, under normal pressure

What should be done when facing a vascular injury during a first entry?

Indications to explore the hematoma:
• Hemodynamic instability
• Active bleeding / expanding hematoma

What should be done when facing a vascular injury during a first entry?

Indications for conversion
• Technical limitation
• Established hemodynamic instability
• When ischemia time is an issue and may be impaired without conversion

What should be done when facing a vascular injury during a first entry?

1. Vision
2. Compress or clamp the injured vessel
3. Careful suction (avoid loosing the pneumoperitoneum)
4. Avoid irrigation
5. Review anatomic landmarks and adequate exposure
6. Analyze thoroughly the situation
Venous injury

1. COMPRESS
2. WAIT
3. REVIEW:
   – Controlled: hemostatic agents
   – Persistent... prepare for surgical repair!

ALWAYS: review at the end...

Suturing

Advantages
- Not expensive
- Availability
- Efficiency
- Definitive
- Various vessel calibers

Disadvantages
- Specific training
- Time for performance
- Demands exposure and vascular control

Metal clips

Advantages
- Time for performance
- Permanent or disposable auto-chargeable
- For temporary or definitive application

Disadvantages
- Impression of safety
- Technical limitation
- Potential tearing / lesion impair

Cortesia de R. Abete
**Bipolar**

**Advantages**
- Permanent
- Cost over time
- Efficiency
- Multifunctional

**Disadvantages**
- Learning curve
- Smaller caliber vessels
- Good energy source is vital

**Venous repair**

**Arterial lesion**
1. COMPRESS
2. PREPARE team for REPAIR
Diameter <5mm, without clinical implication:
- Bipolar
- Clips

**Gonadal Artery - Bipolar**

**Arterial repair (vessel >5mm)**

- Clip-Suture
Remember: in “less anatomic situations”

Restore anatomical landmarks and keep the situation under control!!!

Master energy sources!

Energy sources and dissection tips

Conclusions

- Follow routines
- Careful first entry
- Establish anatomical landmarks and a strategy
- Prevention = key to success
- Lesion = recognition (and action)
- Keep situation under control
References

• Chapron J Am Coll Surg 1997
• Ahmad Cochrane Database Syst Rev 2012
Methodical Approach to the Obliterated Anterior Cul-de-Sac - Aftermath of Prior Cesarean Section

Ted Lee, M.D.
Director, Minimally Invasive Gynecologic Surgery
Magee Womens Hospital
University of Pittsburgh Medical Center

Conflict of Interest Disclosure
Consultant: Ethicon Endosurgery

Objectives

- Describe common challenges associated with obliteration of anterior cul de sac.

- Describe anatomic based strategies, techniques and the necessary tools to address unique challenges associated with dense uterine adhesions from c-section.

Challenges with Uterine Adhesions

- Distortion of anatomy.
- Inability to place uterine manipulator in case of severe anterior abdominal wall adhesions.
- Difficulty in dissecting in the right tissue plane in case of dense uterine adhesions.
- Risk of bladder injury
- Risk of bleeding from ascending branch of uterine artery, bleeding from bladder or abdominal wall.
Meeting the Challenges

• Strategies
• Techniques
• Tools

General Surgical Strategies

• Work from known to unknown.
• Perform the easy and accessible task.
  • Define your anatomy and reestablish your landmark and perspective.
• Find the gateways.
• Avoid direct confrontation with pathology without going through the above.

Strategies for Dense Uterine Adhesions

- Secure the blood supply first before addressing the adhesion.
- Secure cornual pedicles (uteroovarian or IP) first.
- Take the ascending uterine artery from the “posterior approach”
- Or taking uterine from its origin from internal iliac.
- Find normal tissue plane at the level of cervix and vagina.
- Stay close to the uterus becomes easier when the uterus is devascularized.

Posterior Approach

• Ligation of ascending branch of uterine artery without fully developing bladder flap.
• Excellent in patients with extensive and dense uterine adhesions to the bladder and anterior abdominal wall.
• Technique usually not available during open surgery, unique to laparoscopic or robotic approach.

Port Placement

• If uterine adhesion extend above ½ way point between symphysis pubis and umbilicus, use subxiphoid port as the visual trocar initially.

Creating Landmark

• The use of uterine manipulator with colpotimizer to accentuate vaginal fornices. Identify vesicovaginal plane below the level of dense adhesion.
Briesky Navaratil retractor can be used whenever uterine manipulator with colpotomizer cannot be placed due to displacement of cervix or any other reason.

Creating Landmark

Identification of Bladder

- Back filled the bladder.
- The use of Foley catheter guide

Foley Catheter Guide as Bladder Probe


Posterior Approach to Uterine Artery 1

Posterior Approach to Uterine Artery 2

Posterior Approach with Briesky Navaratil Retractor
Lateral Approach to Uterine Artery and Anatomy of Posterior Approach

Vesicovaginal Dissection

Diagnosing Bladder Injury

- Foley bag filled with air.
- Backfill the bladder or cystoscopy.

References

Location Is Everything
The Challenges of Broad Ligament and Cervical Fibroid

Audrey T Tsunoda, MD, PhD
Hospital Erasto Gaertner – Curitiba/Brazil

Disclosures
I have no financial relationships to disclose

Objectives
• Recommend a routine for uterine myoma assessment
• Review anatomical landmarks and tactics
• Demonstrate tips for incision and dissection of cervical and broad ligament fibroids

Reminders...
• Surgical treatment is the treatment of choice for myomas
• Open myomectomy is a safe and effective alternative to hysterectomy
• GnRH pre-op and vasopressine at the myometrium may reduce bleeding
  Am Coll Obstetr Gynecol. ACOG Practice bulletin 2008

Map of the route...

Anatomical landmarks
Step-by-step

- Trocar placement and scope
- Bleeding reduction - resources
- Incision planning
- Suturing
- Extraction

Trocar placement

Exposure

- Ovarian suspension
- Adhesiolysis
- Uterine manipulator

Uterine manipulator
Bleeding reduction

Interventions to reduce haemorrhage during myomectomy for fibroids

- GnRH agonists
- Intramyometrial vasopressine
- Oxytocin IV 40mUI/min intraoperatively
- Tourniquet or Penrose at the isthmus
- Clipping of the uterine arteries and infundilopelvic ligaments

Kongnyuy EJ, Wiysonge CS. Cochrane Database Syst Rev. 2011;1
Alborzi S et al. Fertil Steril 2009

Incision

- No specific rule
- Consider:
  - Size (of the uterus and the lesions)
  - Number
  - Location (relation with uterine vessels, tubes)

Think one step ahead! Remember the suturing!

Cervical myomas

- Uterine manipulator if feasible
- Recover anatomy:
  - uterine vessels and ureter
- Incision: parallel to the cervix / longitudinal
- Grasp the myoma with an adequate forceps
- Check the vessels again
- Suturing

Broad ligament and myomas

- Uterine manipulator if feasible
- Incision: depends on the myoma location in the ligament
- Options: IP and uterine artery temporary clipping
Extraction and final check

- Extraction
- Final check for:
  - Hemostasis
  - Ureter
  - Uterine vessels
  - Remove clips

Conclusions

- Routine
- Anatomy is vital
- Exposure and bleeding reduction tips
- Specific anatomical distortions – recover anatomy, follow the same principles
- Final check

References

- Am Coll Obstetr Gynecol. ACOG Practice bulletin 2008
- Sizzi O et al. J Min Invas Gyn 2007
  - Kongnyuy EJ,Wyssonge CS. Cochrane Database Syst Rev. 2011
Laparoscopic Detection and Repair of Gastrointestinal and Genito-Urinary Tract Injuries—A Game Changer

Alan Lam
Associated Professor
Centre for Advanced Reproductive Endosurgery (CARE)
Sydney Medical School, Australia

Disclosure
• Other: Fellowship
• Support: Stryker Endoscopy

Objective
• Discuss laparoscopic detection and repair of gastrointestinal and genito-urinary tract injuries

Gastro-intestinal injuries

Intestinal injury

Incidence:
• 0.06 to 0.5% for diagnostic laparoscopy
• 0.3–0.5% in operative laparoscopy

Significance:
While relatively uncommon, intestinal injuries can result in serious complications including death following laparoscopy with reported mortality rate from laparoscopy-induced bowel injury up to 3.6%.

Mechanisms of intestinal injury

Entry-related
• Insertion of Veress needle and trocar.
• Half of all laparoscopic-associated intestinal injuries

Operation-related
• trauma from surgery
• thermal injuries
• herniation through port sites
• anastomotic leaks.

References:
Sites of intestinal injury

- small bowel (58%)
- colon (32%)
- stomach (8%)


Preventive measures to reduce intestinal injuries.

1. Routine inspection of bowels below the entry site
2. Choose alternative entry site in patients with suspected midline intra-abdominal adhesions e.g. left upper quadrant
3. Careful bowel manipulation usingatraumatic grasping forceps
4. Limited extent of adhesiolysis using sharp scissor dissection under vision
5. On completion of surgery, meticulously inspect all areas where bowel lysis was required and/or rectal leakage test with air or methylene blue to check for rectosigmoid injury
6. Observe bowels during removal and reinseration of instruments
7. Check integrity of laparoscopic instrument insulation to avoid insulation failure
8. Avoid or limit the use of thermal energy when working close to bowel wall
9. Systematic closure of all 10 mm trocar sites to avoid the risk of port-site hernia.
10. Providing patients, at discharge, with information regarding symptoms which could be signs of impending complications.


Management principles of intestinal injuries

The management of laparoscopy-associated bowel injuries depends on three main factors:

- The timing of the diagnosis
- The patient’s clinical status
- The availability of expert assistance

The timing of diagnosis of intestinal injury

- 30–50% of intestinal injuries are recognised during surgery.
- The remainder may present any time from 1 to 30 days after surgery.
- The length of time from surgery to recognition is variable depending on the site and type of bowel injury.
- Small bowel injuries normally present at 4.5 days (range 2–14) while colon injuries 5.4 days (range 1–29)
- In general, the later the diagnosis, the higher the morbidity and mortality associated with bowel injury.


Reasons for delayed recognition of intestinal injuries

- Injury outside the operating field caused by bowel retraction or handling with sharp instruments
- Unrecognized injury on entry or during closure of port sites
- Thermal injury with subsequent bowel necrosis and breakdown
- Postoperative abscess with subsequent fistula formation
- Herniation through port sites
- Postoperative narcotic medications masking pain
- Atypical presentation of patients with laparoscopic bowel injury due to different inflammatory and immunological response
- Clinician denial


Clinical presentation of intestinal injuries

- Variable and subtle symptoms:
  - Mild abdominal distress
  - Pain at the trocar site near the injured segment
  - Low-grade fever
  - Diarrhoea with normal bowel sounds
  - Mild hypoa with few peritoneal signs
- Classical symptoms such as:
  - Acute abdomen pain
  - Vomiting
  - Tachycardia
  - Hypotension
  - Abdominal rigidity and tenderness.
- Respiratory distress may be mistaken for a chest infection or pulmonary embolism
- Peritonitis becomes generalised, the patient’s condition may deteriorate quickly with a risk of sub-diaphragmatic abscess, septicaemia and multi-organ failure.

Management

• Early recognition and appropriate intervention is the key to minimising morbidity and mortality associated with laparoscopy-associated intestinal injuries.

• Intra-operative findings which should raise suspicion of bowel injury:
  - Bowel-wall haematoma
  - Faecal contamination at the tip of the Veres needle or trocar,
  - Inadvertent 'emboliscopy'
  - Bowel content spillage from the bowel defect
  - Submerging bowel loops under irrigation fluid may reveal air bubble with air insufflation


Intra-operative recognition and management

• The injured bowel should be repaired immediately.

• This can be done laparoscopically or by exteriorising the injured loop through a mini-laparotomy.

• Gastric, small-bowel and colonic injuries can be repaired with one or two-layered closure using 4/0 Vicryl or PDS sutures.

• All non-viable tissue should be excised.

• The management of all bowel injuries should also include a thorough peritoneal lavage and antibiotic coverage.

• Early consultation and involvement of the colorectal team are paramount if the gynaecologist does not have the experience or technical ability to deal with bowel complications.


Patients with suspected intestinal injuries in the postoperative period

• Should be promptly admitted for assessment, intravenous rehydration, parenteral antibiotics and insertion of a nasogastric tube.

• Abdominal radiograph, ultrasound examination, computed tomography (CT) with contrast of the abdomen and pelvis may reveal:
  - Air under the skin/lungs
  - Distended bowel loops with multiple fluid levels.
  - Free fluid:

However, imaging studies and blood tests should not be used solely to guide clinical decision making as they are not always conclusive.

If in doubt, early involvement of other specialists, such as a colorectal surgeon, intensive care specialist, anaesthetist, radiologist and their physician, is advised.

A low threshold for an exploratory laparoscopy or laparotomy if the patient’s condition is unclear.

A second-look operation should include a thorough peritoneal lavage and close inspection of the bowel to identify the site of injury.


Management of postoperative intestinal injuries

• Where the patient’s condition is stable, the patient should be seen, counselled and assessed by a stoma therapist preoperatively.

• The damaged segment of bowel must be excised with closure of the defect with or without diversion.

• Small-bowel injury may require an ileostomy

• Large-bowel injuries may require a Hartmann’s procedure.

• Postoperative care should include close monitoring of the patient’s condition, gastrointestinal rest with intravenous fluids and total parenteral nutrition, antibiotics and progress monitored with CT scans.


Urinary tract injuries

- Incidence
  - 0.05% to 8.3% of all laparoscopies
  - Bladder injuries: 0.02–8.3%
  - Ureteric injuries: 0.5–3%

- While injuries to the bladder are easily recognised, injuries to the ureters are frequently missed during surgery.

- Delayed diagnosis of urinary tract injury is associated with serious morbidity such as fistula formation, peritonitis, loss of renal function and is a frequent cause of medico-legal litigation.


Mechanisms of bladder injuries

- Bladder injury during laparoscopic surgery may occur:
  - Due to insertion of a supra pubic trocar into a full bladder.
  - During bladder dissection such as during laparoscopic hysterectomy or colposuspension, excision of endometriosis, removal of pelvic masses such as uterine myoma or ovarian tumours.
  - The bladder dome is the most common injury site, followed by the posterior bladder base.

Prevention of urinary tract injuries

- Detailed knowledge of pelvic anatomy.
- Good knowledge of avascular surgical spaces.
- Meticulous dissection skills and haemostatic principles.
- Routine bladder drainage during major surgery.
- Insertion of suprapubic trocars above the bladder dome.
- Sharp rather than blunt dissection of the bladder from the cervix during hysterectomy.
- Ability to identify the course of the ureter from the pelvic brim to the bladder, and dissection skills to separate the ureter away from:
  - Infundibulo pelvic ligament (before ligation of this pedicle) or endometriotic implants on the lateral pelvic sidewall and uterosacral ligaments
  - Urine vessels before ligation
  - Vaginal vault angle before securing haemostasis

Management of bladder injuries

- Bladder injuries can be repaired laparoscopically or through a mini-laparotomy with fine, absorbable polydioxanone or vicryl sutures in one or two layers, with interrupted or continuous closure as long as a watertight repair is achieved.
- Non-absorbable sutures should not be used as this can result in formation of calculi, granulomas and fistulas.
- An indwelling urinary catheter should be placed for 7–10 days to promote tissue healing.

Mechanisms of ureteric injuries

- The mechanisms of ureteric injuries include:
  - Transsection
  - Ligation
  - Delayed tissue necrosis from energy damage or ischaemia.
- The common sites of ureteric injury are:
  - The infundibulopelvic ligament where the ureters cross the pelvic brim
  - The ovarian fossa
  - Lateral to the cervix where the ureter passes under the uterine arteries
  - The uterosacral ligament
  - The anterior vaginal fornix.

Prevention of ureteric injuries

- Partial trauma to the bladder can present as a mucosal bulge through the muscularis layer.
- A complete injury will result in the loss of urine through a hole in the bladder wall.
- If in doubt, instillation of methylene blue dye into the bladder via an indwelling urinary catheter will confirm whether dye leaks through the defect into the abdominal cavity.
- Cystoscopy should help evaluate the extent of bladder trauma in relation to the ureteric orifices.

Recognition of bladder injuries

- If there is any suspicion of a bladder injury during laparoscopy, the surgeon should perform a cystoscopy to confirm the presence of a bladder injury and rule out ureteric injuries.
- Ureteric injuries are more common during laparoscopy and can result in serious complications such as hydronephrosis, urinoma, and peritonitis.

Management of bladder injuries

- Bladder injuries can be repaired laparoscopically or through a mini-laparotomy with fine, absorbable polydioxanone or vicryl sutures in one or two layers, with interrupted or continuous closure as long as a watertight repair is achieved.
- Non-absorbable sutures should not be used as this can result in formation of calculi, granulomas and fistulas.
- An indwelling urinary catheter should be placed for 7–10 days to promote tissue healing.

Intra-operative recognition of ureteric injuries

- Over 70% of ureteric injuries present postoperatively.
- Measures to facilitate intra-operative diagnosis and decrease the delay in recognition of ureteric injuries:
  - Cystoscopy after giving intravenous indigo carmine dye may raise suspicion of ureteric damage if the ureteric jet is significantly slower or dye-stained urine cannot be visualised from the orifice of the affected ureter.
  - Failure to freely pass a ureteric stent should also raise suspicion of ureteric obstructive injury.
  - Laparoscopy may demonstrate dye leakage through a defect of the ureteric wall.
  - Blanching of a segment of the ureter should alert the surgeon to the possibility of diathermy injury which, if not recognised, may result in necrosis, urinary leakage and urinary peritonitis.
Management of intra-operatively diagnosed ureteric injuries

• Intra-operative diagnosis of ureteric injuries should allow immediate repair with the help of a urologist.
• Ureteric injuries can be managed via laparotomy, laparoscopic or robotic surgery with over 90% successful outcome.
• Where the ureter is ligated or kinked, the offending ligature should be removed immediately and the ureter’s integrity assessed by monitoring for peristalsis and colour change.
• If there is any concern about tissue viability, a ureteric stent should be inserted and the patency checked with an intravenous pyelogram (IVP) 10 days later.


Management of intra-operatively diagnosed ureteric injuries

• Where the ureter is transected, the repair technique depends on the site and extent of injury.
• Partial transection can be managed by insertion of a double-J shaped stent with or without suturing over the stent. The stent should be left in situ for 6 weeks to aid urinary diversion and promote healing.
• If the ureter is completely transected with no loss of ureteric length and the site of the injury is less than 5 cm from vesicoureteric junction, reimplantation of the ureter directly into the bladder is usually performed, preferably with tunneling of the ureter through the bladder muscularis to avoid ureteric reflux, and recurrent urinary tract infections.
• If the injury is more than 5 cm from the bladder, this can generally be re-anastomosed by uretero-ureterostomy.
• Where there is a loss of ureteric length, a pull up of duodenal or Boari flap may be considered to ensure a tension-free anastomosis.


Diagnosis of delayed ureteric injuries

• Variable clinical presentations in the postoperative phase:
  • loin pain secondary to hydronephrosis/ureteric obstruction,
  • haematuria, oliguria,
  • urinary incontinence in cases of ureterovaginal fistulas,
  • hypertension from obstructive nephropathy,
  • ileus, peritonitis or sepsis.
• Serum biochemistry may reveal rising serum creatinine due to re-absorption of urine transperitoneally.
• Fluid aspirated from intra-peritoneal or retroperitoneal collections can be analysed for similarity to urine osmolality.

Investigations for delayed ureteric injuries

• Ultrasonography, an IVP and CT with intravenous contrast may demonstrate the presence of hydronephrosis or hydroureter, free fluid in the retroperitoneal or intra-peritoneal spaces or intraperitoneal contrast due to urinary leakage.
• Cystoscopic visualisation of ureteric jets into the bladder can be falsely re-assuring in case of incomplete or delayed ureteric injuries.
• Retrograde ureterogram involving injection of contrast up into the ureters via a cystoscope can be used to diagnose more subtle ureteric injuries not evident on IVP or CT studies.

Management of ureteric injuries

• In cases of suspected fistula formation, methylene blue can be instilled into the bladder. Vesicovaginal fistula may be diagnosed on the basis of finding blue dye staining of a tampon placed in the vagina.
• A ureterovaginal fistula may be confirmed when seeing intravenous pyridium producing an orange stain on a tampon in the vagina.
• Once ureteric injury is recognised, corrective surgery should be performed immediately.
• If surgery is contraindicated due to severe infection or tissue necrosis, a percutaneous nephrostomy or retrograde stent placement should be performed to maintain urinary drainage and promote spontaneous healing.


General principles of ureteric repair

1. Tension free anastomosis by ureteric mobilization
2. Ureteric dissection preserving adventitial sheath and its blood supply
3. Minimal use of fine absorbable suture to attain watertight closure
4. Use of peritoneum or omentum to surround the anastomosis
5. Drain the anastomotic site with a passive drain to prevent urine accumulation
6. Stent with a ureteric catheter
7. Consider a proximal diversion

Objectives

- Discuss strategies to minimize the rate of unexpected endometriosis.
- Incorporate anatomy based strategies in the performance of hysterectomy complicated by severe endometriosis.

Consequence of Unexpected Endometriosis During Hysterectomy

- Lack of informed and consent
- Insufficient time allotted
- No treatment or incomplete treatment
- Unhappy patients

Endometriosis Should Be Considered in Every Patient Undergoing Hysterectomy for Pelvic Pain

Endometriosis Encounter During Hysterectomy

- Planned
- Unexpected

Disclosure

- Consultant: Ethicon Endo-Surgery
Minimize Unexpected Endometriosis During Hysterectomy in Patients with and without Pain

- Careful history – the 3 D’s
- Detailed physical exam
- Be aware of debris filled ovarian cyst
- Unexplained nulliparity

General Surgical Strategies

- Work from known to unknown.
- Perform the easy and accessible task.
- Define your anatomy and reestablish your landmark and perspective.
- Find the gateways.
- Avoid direct confrontation with pathology without going through the above.

Gateway to Retroperitoneum

- Make sure your peritoneal incision is big enough so the peritoneal edge can be retracted medially without difficulty.
- Start at pelvic brim where there is no disease.
- Find external iliac, the ureter is in the same “plane” or “layer” as the great vessels
- Mobilize the ureter off the medial leaf of broad ligament if ovary or endometriosis is attached to the broad ligament.
Finding and Dissecting the Ureter

Minimize Risk of Ovarian Remnant

Management of Severe Endometriosis during Hysterectomy

Rule #1: Cut off blood supply first and deal with endometriosis later in patients with obliteration of cul de sac with or without rectal involvement.

Perirectal Incision
Presacral Incision

TLH Obliteration of Cul De Sac
Conclusion

- Minimize the risk of unexpected endometriosis with a good history and physical exam.
- Treat endometriosis if you think it is potentially source of pain.
- Incorporate knowledge of anatomy into your strategies for difficult hysterectomy.
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](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](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](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](http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2078538).