Malcolm G. Munro Disclosures
March 11, 2009

Consultant
- Aega inc
- AMAG Pharma
- Covidien Inc
- Ethicon Women’s Health and Urology
- Galil Medical Inc
- Gynesonics Inc
- Impres Medical
- Karl Storz Endoscopy America (KSEA)

Laparoscopic Complications:
Strategies and Techniques to Reduce Risk
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And what don’t we know?

- Which way are we going...
  - Are we getting better or worse?
- Especially considering specialty-related changes.
  - Resident training issues
  - Advent of even less invasive techniques for a number of conditions:
    - Heavy menstrual bleeding
    - Urinary incontinence
    - Uterine leiomyomas.
Malpractice Cases
Videotape Review

- 22 unedited videos
  - Technical skill/knowledge problem = 3%
  - Visual/perception problem = 97%
    - Deliberately cut wrong structure
    - Injury to unseen structure
Laparoscopic Approach to Surgery

Advantages:
- Magnification
- Illumination
- Monitor – “situation awareness” such that everyone can see

Disadvantages:
- Close-up vs. Wide angle
- Loss of haptic “active” touch
  - Processed through visual cortex

Need to deliberately change

Are we teaching the concept of situational awareness to our residents and fellows?

Are we compulsively practicing it ourselves?

Complications of Laparoscopic Surgery

Menu
- Anesthesia
- Positioning
- Access and visualization
- Dissection
- Electrosurgical issues
- Morcellation and tissue extraction
- Wound management
- Why does this happen? What can we do?
Complications of Laparoscopic Surgery

Menu

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Complications of Laparoscopic Surgery
Peritoneal Access and Visualization

- Soft tissue emphysema
- Hypercarbia
- Vascular injury
- Gastrointestinal injury
- Urinary tract injury

- Soft tissue emphysema
- Hypercarbia
- Vascular injury
- Gastrointestinal injury
- Bladder injury
Complications of Laparoscopic Access

Vascular Injury

- Anterior abdominal wall
- Intraperitoneal vessels
- Retroperitoneal vessels

Access System-Related Death
MAUDE (1997-2004)

This represents the vascular, GI and other deaths attributable or likely attributable to the process of laparoscopic access by manufacturer and year.

Injury to Retroperitoneal Vessels
Danger below the sacral promontary
Insufflation needle at 90°

Injury to Retroperitoneal Vessels
Danger below the sacral promontary

Access System-Related Bleeding
Major Manufacturer Requiring Surgical Intervention
Aggregate 1997-2004

Unpublished
Minimizing the Risk of Injury to Retroperitoneal Vessels

Steps

- Know the anatomy
- Correct patient positioning
- Appropriate incision length
- Correct planes and angles of insertion
- Appropriate counterforce
- Control
- Minimize insertion depth
- Recognize high risk situations
- Alternative techniques and instrumentation

Preventing Injury to Retroperitoneal Vessels

Umbilicus to Aortic Bifurcation

The Umbilicus and Body Mass Index (BMI)

Hurd W. Obstet Gynecol 1992;80:48-51
Minimizing the Risk of Injury to Retroperitoneal Vessels

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Preventing Injury to Retroperitoneal Vessels

Patient Positioning

Avoid insertion in Trendelenberg's position
Preventing Injury to Retroperitoneal Vessels
Insufflation Needle Insertion Plane

Preventing Injury to Retroperitoneal Vessels
Insufflation Needle Insertion Angles

Minimizing the Risk of Injury to Retroperitoneal Vessels
Steps

- Know the anatomy
- Correct patient positioning
- Appropriate incision length
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Minimizing the Risk of Injury to Retroperitoneal Vessels

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Minimize Insertion Distance

Delimiting Insertion Length: Design Influences Technique

Instrument Awareness:
Changes in instrument design may require a change in technique…
Closed Primary Access
Preinsufflation Technique
Minimizing Insertion Distance

Complications of Laparoscopic Surgery
Peritoneal Access and Visualization
- Soft tissue emphysema
- Hypercarbia
- Vascular injury
- Gastrointestinal injury
- Urinary tract injury

Complications of Laparoscopic Surgery
Gastrointestinal Complications of Access
Blunt Tipped Trocars

And at least some “blunt” obturators may not be protective either
Minimizing the Risk to Bowel and Retroperitoneal Vessels

Steps

- Know the anatomy
- Correct patient positioning
- Appropriate incision length
- Correct planes and angles of insertion
- Appropriate counterforce
- Control
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- Recognize high risk situations
- Alternative techniques and instrumentation

Risk of Injury with Previous Abdominal Surgery
Audebert AJ, Gomel V.
N=814

Incidence of subumbilical adhesions by previous surgical incision, as viewed from left upper quadrant port with small caliber (2mm) laparoscope

Minimizing the Risk to Bowel and Retroperitoneal Vessels

Steps

- Know the anatomy
- Correct patient positioning
- Appropriate incision length
- Correct planes and angles of insertion
- Appropriate counterforce
- Control
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- Alternative techniques and instrumentation

Incidence of adhesions by previous surgical incision, as viewed from left upper quadrant port with small caliber (2mm) laparoscope
Preventing Gastrointestinal Injury

Alternate Access Sites

- Left upper quadrant
- Cul-de-sac
- Transfundal (of uterus)
- Other

Intercostal
- 8th intercostal space
- Sup surface of 9th rib
- Anterior axillary line

Infracostal
- Just below costal margin
- Mid clavicular line

Superior Epigastria
Laparoscopic Access with Previous Abdominal Incisions

Left Upper Quadrant Published Papers

- Parker J, Rahimpanah F. *Aust N Z J Obstet Gynaecol* 2001;41:31-4
- Howard FM et al. *JAAGL* 1997;4:595-600
- Childers JM et al. *Gynecol Oncol* 1993;50:221-5

Alternate Techniques

Open Laparoscopy

- Vascular injuries probably decreased; not eliminated
- Little impact on GI injuries

<table>
<thead>
<tr>
<th>Complications</th>
<th>Open Laparoscopy (n=224)</th>
<th>Two Laparoscopies (n=56)</th>
</tr>
</thead>
</table>
| Major
| Vascular | 1/27 (7) | 0 (0) |
| Intestinal | 2 (9) | 0 (0) |
| Total | 3 (11) | 0 (0) |

Values in parentheses are percent.
**Complications of Laparoscopic Surgery**

**Menu**
- Anesthesia
- Positioning
- Access
- Dissection
- Electrosurgical Issues
- Morcellation and tissue extraction
- Wound management
- Why does this happen? What can we do?

**Complications of Laparoscopic Surgery**

**Dissection**
- Vascular injury
- Gastrointestinal injury
- Urinary tract
- Reproductive tract injury
- Nerve injury

**Vascular Complications of Laparoscopic Dissection**

**Intraperitoneal Vascular Injury**
- Care with dissection
  - Don’t yank and tear
  - Protect the side wall vessels
- Prior to closure, observe at reduced pressure
Complications of Laparoscopic Surgery

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Complications of Laparoscopic Surgery

Electrosurgical Issues

- Energy principles
- Bleeding
- Gastrointestinal injury
- Urinary tract injury

Ignorance of electrosurgery among obstetricians and gynaecologists

Jenine Magesan, Scott Reeves, Kim Todd, et al. 4

Objective The purpose of this study was to assess the level of skill in laparoscopic surgery in obstetricians, gynaecologists, and obstetric anaesthetists.

Method A questionnaire was mailed to all obstetricians, gynaecologists, and obstetric anaesthetists in New Zealand.

Results The response rate was 30%.

Conclusions The level of knowledge of electrosurgery among obstetricians, gynaecologists, and obstetric anaesthetists was found to be low.

References

Complications of Laparoscopic Surgery

Electrosurgical Issues

- Energy principles
- Bleeding
- Gastrointestinal injury
- Urinary tract injury

Tissue Effects of RF Energy

Vessel Compression is Necessary for Vessel Coaptation

Voltage, Modulation and Tissue Effect
Complications of Laparoscopic Surgery

Electrosurgical Issues

- Energy principles
- Bleeding
- Gastrointestinal injury
- Urinary tract injury

Complications of Laparoscopic Hemostasis

RF Electrical Gastrointestinal Injury

Breadth and depth of tissue injury depends upon ESU output, time on tissue, and current density.

Complications of Laparoscopic Surgery

Electrosurgical Issues

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- Bleeding
- Gastrointestinal injury
- Urinary tract injury
Complications of Laparoscopic Surgery

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Seven hundred twenty-five (86.3%) of the 840 in which the size of the original fascial defect was noted, occurred in sites where ports 10 mm in diameter or larger had been placed.

A total of 933 was reported from an estimated 4,385,000 laparoscopic procedures (an incidence of 21 per 100,000); 167 (17.9%) were reported to have occurred despite fascial closure. Six hundred sixty-five patients (71.3%) had subsequent surgical repair. Seven hundred twenty-five (86.3%) of the 840 in which the size of the original fascial defect was noted, occurred in sites where ports 10 mm in diameter or larger had been placed. The occurrence is a function of the number of procedures performed (P < .0001) and is not related to the length of the surgeon's career (P = .41). In at least 157 instances (16.8%), the presenting symptom or morbidity was directly related to the involvement of the large or small intestine. Conclusion: Post-incisional hernias occur at an appreciable incidence of 21 per 100,000 cases. Associated with significant morbidity, they are most likely to occur when large ports are used. An analysis indicates, however, that prophylactic measures should be developed to minimize the risk of hernia formation.

Wound Complications: Laparoscopic surgery
Hernia & Dehiscence

Richter’s Hernia

Which incisions should be closed?
Blunt Tipped Trocars

Influence of Trocar Design on Wound Parameters
Fascial Injury

Munro & Tarnay Obstet Gynecol 2004

- No Movement
- No Movement

$p > 0.05$

Fascial Closure Guidelines

- Close selected fascial and peritoneal defects
- All defects made with bladed devices ≥10 mm
- Defects > 5 mm; < 10 mm
  - After significant tissue extraction
Complications of Laparoscopic Surgery

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Instinctive Thinking

Experience and Training
- Dependant
  - Patterns sought in long-term memory

Effective Decision Making

- Requires a balance of...
  - Instinctive thinking
    - Improves with Experience
    - >> 5,000 hours to be "expert"
      - "practice, practice, practice"
    - Subconscious processing
  - Deliberate thinking
    - Conscious process – learning and repetition based
Instinctive: Fear

- State of arousal
- Tachycardia
- Momentary Autism
  - Brain limits incoming information
  - Vision restricted
  - Aggressive mood

Deliberate

Slow Down

Tamponade

Take a deep breath
Wait a few beats to regain composure

Surgery: Solutions

Laparoscopy Advantage - Everyone Can See

Ask for Help

- Assistant surgeon
  - Encourage active involvement
  - Ask "What do you think about this?"

- Nurses
  - Eliminate hierarchy
  - Ask for help

- Anesthesiologist
  - Other expertise and experience
  - Ask for help
Deliberate Thinking: Solutions

Deliberate becomes instinctive over time

Learn from the mistakes of others....

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