Anatomy for the Laparoscopic Surgeon

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Laparoscopic Anatomy

- A sound knowledge of anatomy is crucial for performing safe, efficient and effective surgery.
- The gynecologic laparoscopist must develop a thorough understanding of the anatomy of the:
  - Anterior abdominal wall
  - Structural anatomy of the abdomen and pelvis
  - Retroperitoneal landmarks and underlying structures
  - Endopelvic fascial supportive structures
Laparoscopic Anatomy
Anterior Abdominal Wall

• Structural landmarks of the anterior abdominal wall
  – Umbilicus
  – Anterior superior iliac spines
  – Pubic symphysis

• Vessels of the anterior abdominal wall
  – Inferior epigastric vessels
  – Superficial epigastric vessels
  – Superficial circumflex iliac vessels

• Layers of the anterior abdominal wall
  – Rectus abdominis muscle
  – Anterior and posterior rectus sheath
  – Arcuate line
Anterior Abdominal Wall Vessels

• **Inferior epigastric vessels**
  – Originate from the external iliac vessels before entry beneath the inguinal ligament
  – Courses medial to the round ligament
  – Travels underneath the lateral third of the rectus abdominis muscles
  – Typically not visualized by transillumination

• **Superficial epigastric vessels**
  – Courses within the subcutaneous tissue of the anterior abdominal wall
  – May be visualized by transillumination
  – Follows a similar course to the inferior epigastric vessels
Superficial pelvic and peritoneal structures

- Anterior abdominal wall
  - Median umbilical fold
    - Peritoneal covering of the median umbilical ligament/urachus
  - Medial umbilical folds
    - Peritoneal covering of the obliterated umbilical arteries
    - Allow laparoscopic surgeon to identify uterine artery because of origin from internal iliac artery
  - Lateral umbilical folds
    - Peritoneal covering of the inferior epigastric vessels
    - Direct hernias occurs medial to the lateral umbilical fold
    - Indirect hernias originates lateral to the umbilical fold
    - Hasselbach's Triangle:
      Laterally: Inferior Epigastrics artery and vein
      Medially: Rectus Sheath
      Inferiorly: Inguinal Ligament
      Posteriorly: Transversalis Fascia
Anterior Abdominal Wall Anatomy

- **Urachus**
  - Courses from the bladder to the umbilicus in the midline beneath the anterior abdominal wall and median umbilical fold
  - Lies in the space of Retzius, between the transversalis fascia anteriorly and the peritoneum posteriorly
  - Lumen normally becomes obliterated during embryonic development, thus becoming a functionless remnant
  - Patent urachus is rare
Anterior Abdominal Wall Anatomy
# Anterior Abdominal Wall Anatomy

## Anatomic Landmark Lateral to Midline

<table>
<thead>
<tr>
<th></th>
<th>Inferior Epigastric Vessel</th>
<th>Superficial Epigastic Vessel</th>
<th>Superficial Circumflex Iliac</th>
<th>Lateral Margin of Rectus Muscle</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 cm above symphysis</td>
<td>5.6 +/- 1.0 cm</td>
<td>5.5 +/- 2.0 cm</td>
<td>8.5 +/- 1.0 cm</td>
<td></td>
</tr>
<tr>
<td>5 cm above symphysis</td>
<td>5.2 +/- 1.2 cm</td>
<td>5.2 +/- 1.8 cm</td>
<td>9.5 +/- 1.6 cm</td>
<td></td>
</tr>
<tr>
<td>16 cm above symphysis</td>
<td>4.6 cm</td>
<td>4.6 +/- 1.4 cm</td>
<td>10.7 +/- 1.7 cm</td>
<td>7.6 +/- 1.5 cm</td>
</tr>
</tbody>
</table>

Ideal Port Placement
A: 5 cm above symphsis / 8 cm from midline
B: 3 cm above symphsis / 4 cm from midline
C: 16 cm above symphsis / 8 cm from midline

Variations in Anatomy
Four types of umbilical ligaments identified in 57 Korean adult cadavers

Types of umbilical rings identified in 57 Korean adult cadavers

Types of Umbilical Rings
en bloc cadaveric anterior abdominal wall

(oval or round) (obliterated or slitted) (covered by connecting band)

Types of umbilical rings identified in 57 Korean adult cadavers

Types of Umbilical Rings

(covered by connecting band)

(obliterated or slitted)

(oval or round)
Anterior Abdominal Wall Anatomy

Effect of obesity on location of great vessels

Umbilical Port Placement
Umbilical Port Placement

- Ureter
- Left common iliac
- Right common iliac
- Aortic bifurcation

[Image of a surgical view with labels]
Abdominal/Pelvic Cavity Anatomy

• Landmarks
  – Sacral promontory
  – Uterus
  – Ovaries
  – Ureters
  – Rectosigmoid
  – Bladder
  – Ureters
Bony Pelvis

- Ilium
- Ischium
- Pubis

- Ilium connected to sacrum at sacroiliac joint

Pelvic inlet

Anteriorly: Pubic symphysis
- Pubic tubercle

Laterally: Iliopectineal line
- Linea terminalis

Posteriorly: First sacral vertebra
Pelvic Floor

Muscles:
• Puborectalis
• Pubococcygeus
• Iliococcygeus
• Coccygeus
• Piriformis

Bony Landmarks:
• Pubic symphysis
• Ischial spine
• Coccyx

Ligaments
• Sacrospinous ligaments
• Sacrotuberous
Pelvic support
• Uterosacral ligaments
• Cardinal ligaments
• Rectovaginal fascia
• Pubocervical fascia

Endopelvic fascia
• Collagen fibers
• Elastin
• Smooth muscle
Uterosacral Ligament Anatomy
Ureter:
• Enters pelvic cavity at the pelvic brim
• Courses superficial to the common iliac artery and deep to the infundibulopelvic ligament
• Travels in the medial leaf of the broad ligament

Pelvic vasculature:
• Internal iliac
• External iliac
• Ovarian vessels
Ureter:
- Passes lateral to the uterosacral ligament and beneath the uterine artery lateral to the cervix
- Travels in an endopelvic fascia tunnel medially and anteriorly along the upper part of the vagina, and enters into the bladder wall and then opens into the trigone
Course of Ureter

Protecting the ureter during pelvic surgery
Abnormal Course of Ureter
Pelvic vasculature

Hypogastric artery

**Anterior branch**
- Obturator artery
- Inferior gluteal artery
- Umbilical artery
- Uterine artery
- Vaginal artery
- Superior vesical artery
- Inferior vesical artery
- Middle rectal artery
- Internal pudendal artery
- Obliterated umbilical

**Posterior branch**
- Iliolumbar artery
- Lateral sacral arteries
- Superior gluteal artery
Side-wall Anatomy
Retroperitoneal Anatomy
Sacral Anatomy
Hypogastric artery

**Anterior branch**
- Obturator artery
- Inferior gluteal artery
- Umbilical artery
- Uterine artery
- Vaginal artery
- Inferior vesical artery
- Middle rectal artery
- Internal pudendal artery

**Internal pudendal branches**
- Inferior rectal artery
- Perineal artery
- Posterior labial arteries
- Dorsal artery of clitoris
- Deep artery of clitoris
- Artery of bulb of vestibule
Laparoscopic Anatomy

• A sound knowledge of anatomy is crucial for performing safe, efficient and effective surgery
• This understanding will keep the Gynecologic surgery operating in a safe manner and reduce complications
References

• Netter Atlas of Human Anatomy