

Complications of laparoscopy

Dr. kh.moghaddam



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A. INTRODUCTION

* Rate

- Major complications: low. 1/1000
 - Complications related to initial abdominal access
 - less than 1%
- * Up to half of complications**

❑ A review of gynecologic procedures performed from 1975 to 2002:

- ♣ Access-related bowel injuries:

4.4/10,000 procedures

- ♣ Entry-related vascular injuries:

3.1/10,000 procedures

- ♣ Hasson Vs closed entry:

- ♣ not associated with fewer complications

0629 trocar injuries reported to the FDA included

- * ♣ 408 injuries to major blood vessels
- * ♣ 182 other injuries (mainly bowel injuries)
- * ♣ 30 abdominal wall hematomas

*Mortality rate

0.03-0.49%

*32 deaths

- ♣26: due to vascular injuries

- ♣Injury to the aorta and inferior vena cava: most commonly

- ♣6: due to bowel injuries.

- ♣The diagnosis

- ♣delayed in 10%

- ♣mortality rate: 21%. ABOUBAKR ELNASHAR

Laparoscopic Vs laparotomy complications:

- ♣ less common

- ♣ more serious.

- ♣ 8.9 % VS. 15.2%

(MA)

❑ Risk factors

1. Prior surgery for intraabdominal or pelvic disease

- Diverticulitis
- PID
- {adhesions}

2. Other conditions

- I. Extensive bowel distention
- II. Very large abdominal or pelvic mass
- III. Diaphragmatic hernia
- IV. Poor cardiopulmonary

Prevention:

- ♣ Plan laparoscopic approach
- ♣ an open approach may be preferred.

Surgeon experience (number of the specific procedure) for some, but not all, types of surgical procedures

♣ low-volume Vs high-volume surgeons
laparoscopic hysterectomy

* ♣ overall rates for complications were similar (9.8 and 10.4 %, respectively)

- * Absolute contraindications
 - * Uncorrectable coagulopathy
 - * Massive hemoperitoneum/hemoretroperitoneum
 - * Abdominal wall infection
 - * Generalized peritonitis
 - * Retroperitoneal abscess
 - * Intestinal obstruction
 - * Suspected malignant ascites

*Types of Complication | Anesthesia | Surgery

- ☐ Related to abdominal access
- ☐ Related to pneumoperitoneum
- ☐ Related to tissue dissection and hemostasis
- ☐ Immediate
- ☐ Delayed

I. RELATED TO ABDOMINAL ACCESS 1. Vascular injury

Rate:

♣ 0.1- 6.4/1000 = 0.9/1000

- 2nd to anesthesia as a cause of death from laparoscopy - most commonly occurs while
 - ♣ Placing a pneumoperitoneum needle (eg, Veress)
 - ♣ Primary trocar
- Major vascular injuries aorta, inferior vena cava, iliac vessels
Minor vascular injuries vessels of the abdominal wall, mesentery, or other organs.

I. Minor vessels injuries

- ♣ Identification: using probing instruments or an irrigator-aspirator.

- ♣ TT:

- ♣ Blood transfusion

- ♣ conversion to an open procedure, or reoperation.

- ♣ coagulated or clipped.

❑ laceration of the inferior epigastric artery

♣ During:

- ♣ placement of lateral trocars (usually as secondary trocars) in the lower abdomen
- ♣ The most common vascular injury
- ♣ More common than injury to the superior epigastric vessels {superior epigastric vessels in the upper abdominal wall often form a plexus of arteries}

Omental and mesenteric vessels

- ❖ During: initial abdominal access to establish pneumoperitoneum particularly if there are adhesions 3. Other abdominal wall vessels
- ❖ When:
 - ❖ trocar is not placed under direct vision
 - ❖ secondary trocars are placed without prior transillumination of the abdominal wall to identify their presence.

Bleeding due to a vascular injury at a port site

- ♣ may not be observed with the port site cannulas in place and the abdomen insufflated {tamponade}.

- ♣ Delayed bleeding

- ♣ typically within one hour

- ♣ can present 2 or 3 days after surgery.

- ♣ Clinical manifestations:

- ♣ abdominal wall pain

- ♣ abdominal wall or flank ecchymosis

- ♣ external bleeding from a trocar site.

- ♣ hemodynamic instability

TT of abdominal wall hematoma

- ♣ Conservative:
 - ♣ Hemodynamically stable
 - ♣ No signs of hematoma expansion
- ♣ Intervention
 - ♣ hematoma expands
 - ♣ hemodynamically unstable
 - ♣ hematoma becomes infected.
 - ♣ open surgical approach.
 - ♣ Percutaneous embolization

Major vessels

- Rare
- 1 to 1.0%
- Injury to major venous structures
- inferior vena cava, iliac vein:
- massive air embolism {unrecognized IV placement of a pneumoperitoneum needle and subsequent gas insufflation}

❑ Cause:

- ♣ lack of appreciation for the proximity of important vascular structures to the anterior abdominal wall
- ♣ The distance from the anterior abdominal wall to the aorta can be as little as 2 cm in thin individuals
- ♣ The distal aorta, which lies directly beneath the umbilicus
- ♣ Right common iliac artery, which crosses the midline

Identification

- ♣ rapid exsanguination and death
- ♣ free blood in the abdominal cavity.
- ♣ may not be appreciated right away {bleeding into the mesentery or retroperitoneum}

❑ Treatment

1. Consultation with a surgeon experienced with vascular procedure
2. The anesthesia team should be immediately notified
3. Minimize hypotension and blood loss
 - ♣ maintain the extremities in an elevated position
 - ♣ abdomen should be rapidly opened with a midline incision
 - ♣ pressure applied directly to the bleeding site for initial control
 - ♣ abdominal cavity can be packed, if needed.

Management of hemorrhage

Prevention

- ♣ Meticulous hemostasis during dissection

Significant hemorrhage

- ♣ immediately notify the anesthesiologist for
- ♣ fluid resuscitation
- ♣ Transfusion
- ♣ potential need to convert to an open procedure

❑ Mild-to-moderate bleeding

○ Local compression

- ♣ allows a surgeon time to consider strategies for definitive hemostasis
- ♣ definitive treatment.

Dry hemostatic agents

- ♣ Surgicel, Gelfoam can be passed through a laparoscopic port and used in conjunction with mechanical compression.

❑ Once bleeding has slowed or ceased

- * ♣ area is inspected to identify the bleeding point
- * ♣ isolated and controlled with
- * ♣ clip, suture, cautery
- * ♣ The field should then be irrigated carefully with saline.

❑ Conversion to an open procedure due to bleeding

♣ Determined by

❖ **1. Bleeding**

1. Rate, amount
2. Presence 1 (or lack) of a clearly defined source

❖ **2. Patient:**

1. Clinical status: tachycardia, hypotension, sepsis
2. advanced age or poor functional status and comorbidities: cardiopulmonary conditions, obesity, cirrhosis, clotting disorders
3. Surgeon: Comfort of the surgeon with his or her ability to see and control the bleeding quickly using laparoscopic techniques.

Gastrointestinal puncture

- ♣Rate:

- ♣0.03 to 0.18% = 1.8/1000

- ♣3rd leading cause of death, after anesthesia and major vascular injury

- ♣ Due to:

- ♣ Electrosurgery

- ♣ Pneumoperitoneum needle (eg, Veress)

- ♣ Trocar placement

- ♣ Sites:

- ♣ The small bowel is the most commonly injured during abdominal access

- ♣ stomach, liver, and colon injuries have been reported when subcostal access techniques are used

♣Prevention:

♣Decompressing the stomach with an orogastric or nasogastric tube prior to upper abdominal access

Identification

♣ ±Delayed:

♣ Postoperative often following discharge

♣ peritonitis

♣ significant cause of morbidity and mortality

□ TT:

- ♣ Injuries due to the pneumoperitoneum needle (eg, Veress): conservatively.
- ♣ Most other trocar punctures:
 - ♣ simple primary closure
 - ♣ reapproximating the bowel wall with simple sutures in one or two layers.
 - ♣ discrete large bowel injuries: colostomy is rarely needed.

Urinary injury

- Bladder puncture

- ♣ Rate: rare

- ♣ Risk:

1. history of prior pelvic surgery
2. primary or secondary trocar insertion, when a midline, suprapubic trocar is placed in a patient with an over distended bladder.

Prevention

1. Foley catheter should be placed to decompress the bladder.
2. The catheter can also provide a means for early recognition of this complication.

♣ Clinical signs

- ♣ gaseous distention of the urinary drainage bag
- ♣ bloody urine.
- ♣ If a bladder injury is suspected instillation of indigo carmine or methylene blue into the bladder may aid in identifying an injury.

□ TT:

- ♣ If the bladder is punctured with a pneumoperitoneum needle (eg, Veress): repair is generally not needed.
- ♣ Small 3 to 5 mm punctures in the dome of the bladder generally resolve spontaneously with bladder decompression for 7 to 10 days.
- ♣ Larger or irregular defects
 - ♣ suture closure with absorbable sutures using an open or laparoscopic approach .
 - ♣ The Foley catheter should be left in place for 4 to 10 days depending on the size and location of the puncture or tear.
 - ♣ If the operating surgeon is unsure of bladder management: urology consultation

Nerve injury

- ♣ Not likely to be recognized intraoperatively
- ♣ can result in persistent postoperative pain.
- ♣ Prevention:
 - ♣ The location of port sites
 - ♣ Procedure-specific dissection should keep neighboring nerves in mind.

❑ Port-site hernia

♣ Rate:

♣ up to 6% = 2.1/1000

♣ less common compared with incisional hernia occurring after open surgery

♣ Increase with

1. More complex procedures:

- multiple ancillary ports
- larger diameter ports used for specimen removal, stapling devices

2. Single-site surgery

- Other factors:
- older age
- higher BMI

❑ Clinical manifestations

- ♣ gross disruption of the wound with drainage
- ♣ with exertion or Valsalva: bulge
- ♣ if bowel or omentum is incarcerated: painful continuous bulge
- ♣ ± clinical signs of bowel obstruction or infarction

⊖ Prevention:

- ♣ Close fascial defects if a port >12 mm
- ♣ some advocate repairing port sites ≥ 10 mm

❖ TT:

- ♣ repair to prevent the development of intestinal complications (obstruction, strangulation)

❑ Surgical site infection

Rate: less common following laparoscopic compared with open procedures

CP:

♣ peri-incisional erythema

♣ wound drainage

♣ Fever {±necrotizing fascial infection} ♣ umbilicus is more common site infection {use of the umbilicus as a specimen extraction site}

❑ Prevention:

1. prophylactic antibiotics
2. sterile technique
3. use of bags during specimen extraction.

❖ TT:

1. drainage,
2. Packing
3. antibiotics.

II. RELATED TO PNEUMOPERITONEUM

❖ SC and mediastinal emphysema

- ♣ due to insufflation of an improperly positioned pneumoperitoneum needle (eg, Veress) or port. 20/1000 2. Pneumothorax, cardiac arrhythmia, carbon dioxide retention
- ♣ Related to the physiologic effects of insufflation.
- ♣ Patients who have poor cardiopulmonary reserve are not likely to be offered a laparoscopic procedure: these complications are uncommon.

Postoperative abdominal or shoulder pain

- ♣ {retained CO}

- ♣ referred pain {irritation of the diaphragm}. 4. Air embolism due to venous injury.

III. RELATED TO TISSUE DISSECTION AND HEMOSTASIS

❖ Vascular injuries

- ♣ More commonly
- ♣ related to abdominal access
- ♣ Injuries to
 - ♣ inferior vena cava
 - ♣ left hepatic vein
 - ♣ abdominal aorta
 - ♣ inferior phrenic vessels

Cause of significant hge: Technical error

1. inadvertent cautery away from the field of dissection
2. excessive thermal spread
3. improper staple length, height, or stapling technique
4. failure to recognize a significant vascular structure prior to its division with nonvascular stapling instrument.

❑ Gastrointestinal injury

♣ Serious

♣ delayed diagnosis increases the risk of bowel necrosis, perforation, and potentially death

♣ Cause:

1. during abdominal access

2. electrosurgical injury

3. trauma during dissection or manipulation.

♣ Symptoms manifest within 12 to 36h postoperatively can be delayed for up to 5-7 days.

❑ Suspicion:

1. If a patient does not gradually improve following laparoscopic surgery: abdominal pain, tachycardia or fever
2. Free intraabdominal air on imaging not be helpful {40% of patients will have more than 2 cm of free air at 24 h post laparoscopy, . often may be seen on a radiograph up to a week postoperatively}

♣ Volume:

♣ should gradually decrease with time

♣ increasing suggests ruptured viscus until proven otherwise.

TT:

- ❖ Electrosurgical injuries identified in the operating room
 - ❖ inverted and oversewn
 - ❖ to healthy tissue at the margins, or
 - ❖ Resection (with a 1 to 2 cm margin around the injury site) {visible thermal injury is always less than the actual injury}
1. significant size
 2. any risk of not getting a healthy tissue margin.

Urinary injury

❖ Bladder injury

○ Causes:

- ♣ during the insertion of trocars
- ♣ thermal injury during dissection

○ Rate:

- ♣ less than 0.5%
- ♣ varies widely depending upon the type of surgery being performed

○ TT:

- ♣ simple catheterization
- ♣ laparotomy depending upon the severity of the injury.

Ureteral injury

- ♣ Rate: less than 2%

- ♣ Cause:

- ♣ pelvic dissection

- ♣ thermal injury by excessive use of an energy source adjacent the ureter

♣Prevention:

♣If pelvic dissection is anticipated to be in an inflamed operative field or reoperative field:

1. ureteral stents

- ♣to help identify the ureters to minimize ureteral injury
- ♣injury can still occur

2. identification of the ureter

- ♣The best mean
- ♣using anatomic landmarks observation of peristalsis

3. dissection and mobilization of the ureter

- ♣With complex surgeries or
- ♣where anatomy is unclear

confirm and document the integrity of the ureters before closing.

♣At the conclusion of any laparoscopic procedure in which the operative field is in the vicinity of the ureter(s)

❑ IV. OTHER COMPLICATIONS 1. Port site metastasis

♣ Rate:

♣ 1-2% of laparoscopic procedures performed in the presence of intraperitoneal malignancy

♣ equivalent to the rate of wound metastasis after laparotomy performed under similar conditions

♣ Observed in:

♣ as little as 10 days following laparoscopy.

❑ Mechanisms

- ♣ hematogenous spread
- ♣ direct contamination by tumor cells
- ♣ secondary effects from pneumoperitoneum (eg, immune suppression), and surgical technique

❑ Prevention:

- ♣ use of wound protectors
- ♣ specimen extraction bags
- ♣ instillation of agents to prevent tumor growth
- ♣ port-site excision.

Vulvar edema

- * ♣ few case reports of unilateral vulvar edema after operative laparoscopy
- * ♣ Mechanism Unclear
- * ♣ condition is self-limited and resolves
- * ♣ TT:
- * ♣ ice packs
- * ♣ bladder catheterization
- * ♣ analgesia
- * ♣ swelling related to vascular bleeding and may require intervention

- Triad of major laparoscopic complications Urinary (least during entry) Bowel (most common in general) TRIAD Vascular (suspected on sudden hypotension on entry)

SUMMARY AND RECOMMENDATIONS

- Most complications occur during abdominal access, but other complications can occur related to abdominal insufflation and tissue dissection.
- The overall rate of these complications is low
- Prevention: Proper selection of patients, knowledge of surgical anatomy, and attention to proper abdominal access techniques

❑ Risk factors Prior surgery

- abdominal adhesions excessive bowel distention very large abdominal or pelvic masses, diaphragmatic hernia. Patients with poor cardiopulmonary reserve may not tolerate pneumoperitoneum.
- For patients with risk factors for laparoscopic complications an open surgical approach may be preferred.

❑ Vascular injury

- ♣ most commonly occurs during abdominal access
- ♣ second only to anesthesia as a cause of death from laparoscopy.
- ♣ The most common vascular injury overall is laceration of the inferior epigastric artery
- ♣ injury to major vascular structures can occur and are life-threatening injuries
- ♣ may not be immediately appreciated during laparoscopy because bleeding
- ♣ can be retroperitoneal, rather than into the peritoneal cavity, or tamponaded by a port.

- When minor abdominal wall vessel injury is unrecognized: an abdominal wall hematoma may occur; most of which can be managed conservatively.
- When major vascular injury is identified: consultation with a surgeon experienced with vascular procedures should be obtained without delay.
- Significant hemorrhage can often be attributed to a technical error such as inadvertent cautery away from the field of dissection excessive thermal spread of electrocautery improper staple length, height, or stapling technique; failure to recognize a significant vascular structure prior to its division with a nonvascular stapling

As in open surgery, mechanical compression and application of topical hemostatic agents are appropriate initial strategies.

Moderate bleeding during laparoscopic surgery can be controlled with clips, suture ligation, or electro surgical methods depending upon the source of bleeding and nature of surrounding tissues.

An important source of patient morbidity results from the failure to convert to an open procedure in a timely fashion when control of bleeding is challenging. Laparoscopic hemostasis that is partially effective or ineffective can lead to significant blood loss and its associated clinical consequences.

- Injury to the bowel
- can relate to initial abdominal access or during the course of the operation due to electrocautery, or tissue trauma during dissection.
- The small bowel is the most commonly injured GIT structure during laparoscopic surgery, but stomach, liver, and colon injury can also occur.
- The frequency of gastrointestinal injury depends upon the nature of the procedure.
- Injury to the stomach can be minimized by maintaining stomach decompression with a nasogastric or orogastric tube during the procedure.
- Any patient who does not gradually improve or who continues to have abdominal pain following laparoscopic surgery should be evaluated for possible gastrointestinal injury.

☐ Injury to the bladder

☐ most commonly occurs during abdominal access rather than during the course of dissection.

☐ A history of prior pelvic surgery increases the risk of bladder injury.

☐ The risk of bladder injury can be minimized by catheterizing the patient prior to the procedure

❑ Port-site hernia

- ♣ less common compared with incisional hernia occurring after open surgery.

- ♣ The risk increased with

- ♣ larger diameter ports (≥ 12 mm), such as those used for specimen removal, stapling devices

- ♣ single-site surgery.

- Other complications

- include nerve injury, surgical site infection, upper urinary tract injury, and port site metastasis

