

# Best Access to the Abdomen

**LOYOLA  
MEDICINE**



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# Objective

- Describe different techniques for primary trocar entry
- Interpret data regarding techniques of laparoscopic abdominal entry

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# History of Laparoscopic Access Techniques

- **Georg Kelling** (1866-1945):
  - German surgeon
  - The first person to create the pneumoperitoneum
  - He performed this procedure on dogs
- **Jacobeus**
  - Sweden
  - Performed the first laparoscopy in a human
- **Janos Veres** (1903-1979):
  - Hungarian
  - Who has been primarily used the needle for the creation of a pneumothorax

# History of Laparoscopic Access Techniques

- **Raol Palmer (1904-1945):**
  - French gynecologist
  - Introduced the most popular method of the **closed laparoscopic** entry in 1947
  - Use of the Veress needle to induce CO2 pneumoperitoneum for laparoscopy
  - Published on its safety in the first 250 patients
- **Harrith M. Hasson:**

An American who described the open access laparoscopy in 1970
- **JR Dingfelder:**

Who developed the **direct laparoscopic trocar** insertion technique in 1978

# Laparoscopic entry systems

## Closed Technique

- *Blind Non-Visual Entry*
  - Insufflated
    - Closed conventional trocar entry
    - Radially expanding trocar entry
  - Non-insufflated
    - Direct sharp trocar entry
- *Visual entry*
  - Optical trocar (*Optiview, Visiport*)

## Open Technique

- Hassan trocar entry

# Preoperative Evaluation

- Evaluate for the possibility of adhesions
  - Prior operative reports
  - History of peritonitis
  - Abdominal scars
- Umbilical anatomy
- Distribution of abdominal wall adiposity
  - Obese patient
  - Thin patient

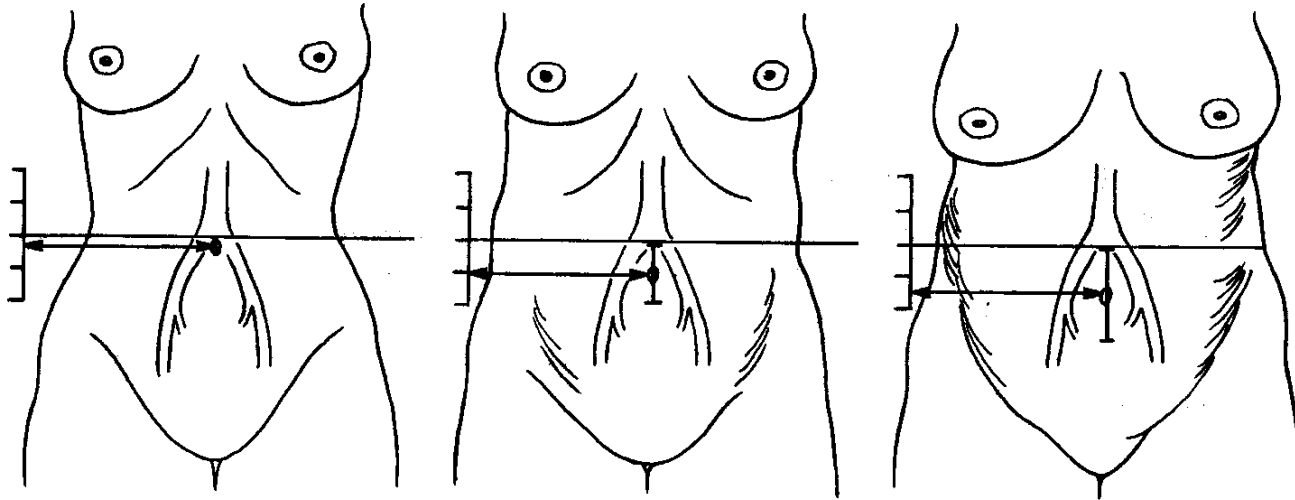
# In the OR

- Empty gastric contents
- Position patient
- Examine abdomen
  - Size
  - Surgical scars
  - Laxity of abdominal wall
  - Umbilical anatomy (?hernia)
  - Palpate bifurcation and sacral promontory
  - Presence of mass





# Avoiding the Great Vessels: Size Does Matter

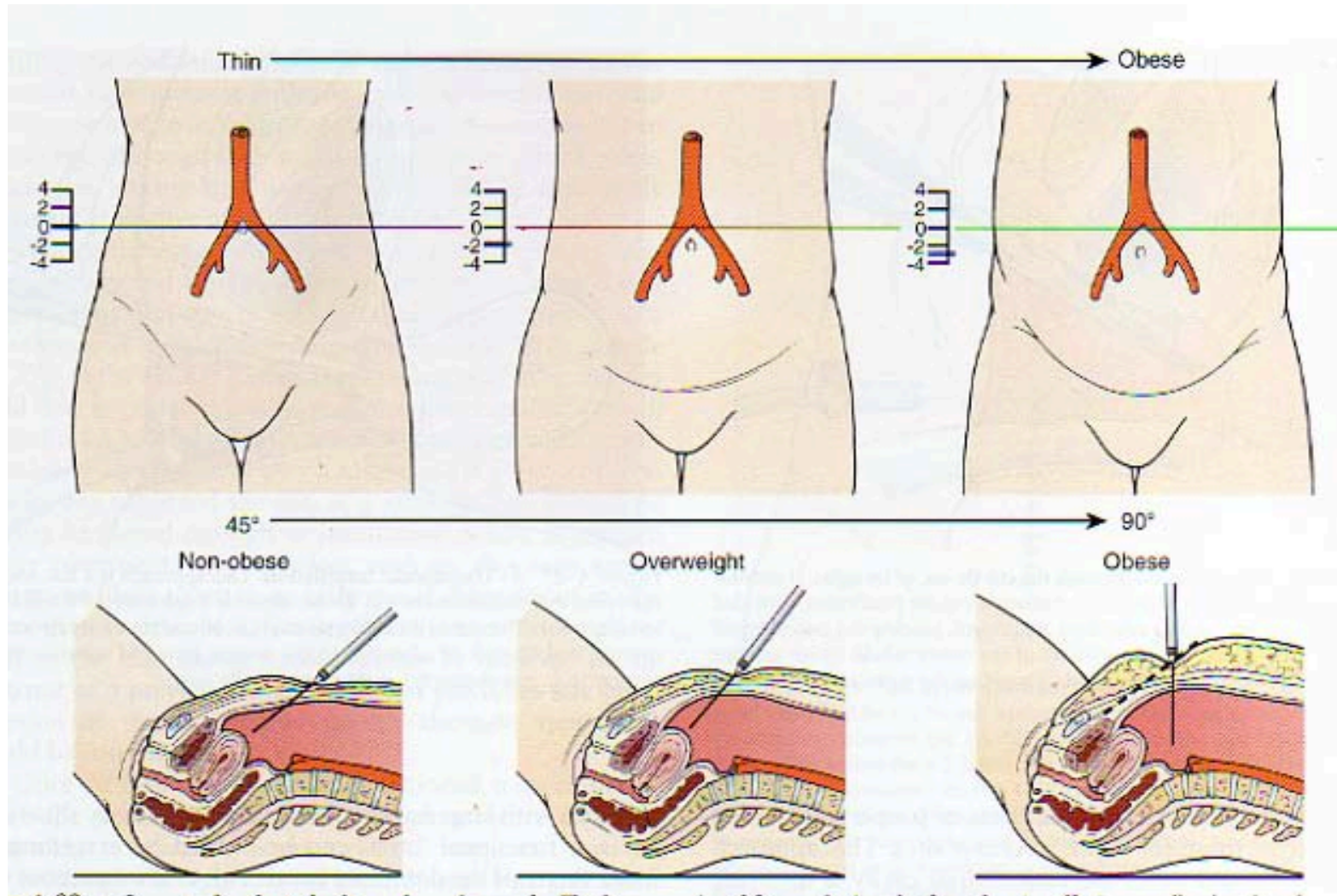


**Figure 12.7.** Relationship of Aortic Bifurcation to Umbilicus. In women of normal weight for height the bifurcation is, on average, 0.4 cm cephalad to and 6 cm ( $\pm 3$ ) beneath the umbilicus. For overweight women, the distances are 2.4 and 10 cm ( $\pm 2$ ), respectively. In obese women, the umbilicus is 2.9 cm inferior to the bifurcation and 13 cm ( $\pm 4$ ) anterior to the level of the aorta.

Abdominal CT scans from 35 reproductive-age women were reviewed to determine the location of the umbilicus

The location of the umbilicus, but not the aortic bifurcation, was more caudal in heavier women

## Effect of obesity on location of great vessels



Isaacson Keith., ed. Complications of Gynecologic Endoscopic Surgery. Philadelphia: Saunders, 2006.

# Laparoscopic entry systems

## Closed Technique

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## Open Technique

- Hassan trocar entry

# Closed conventional trocar entry ( Veress Needle entry )

- The most popular technique used for a laparoscopic entry, esp. popular with gynecologists.
- Key steps
  - Veress needle insertion sites
  - Creation of pneumoperitoneum with a needle
  - Blind insertion of a first trocar after creation of pneumoperitoneum

# Closed conventional trocar entry ( Veress Needle entry )



Disposable Veress needle blunt tip

# Closed conventional trocar entry ( Veress Needle entry )



Nondisposable Veres needle blunt tip

# Closed conventional trocar entry ( Veress Needle entry )

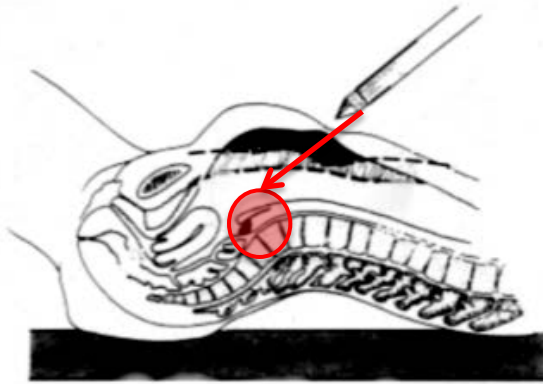


Classic nondisposable trocar

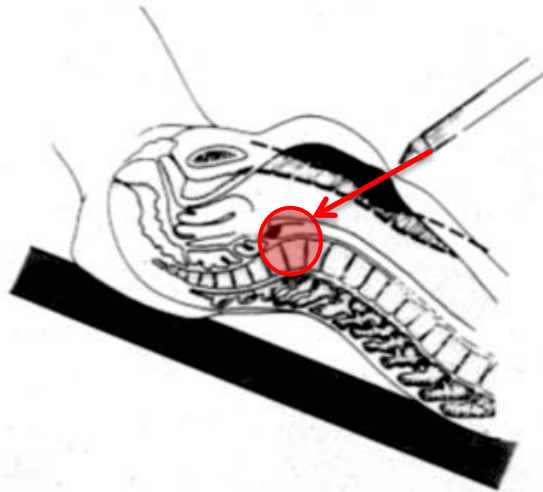
# Veress Needle Insertion Sites

- The umbilical area
  - The mid sagittal plane
  - The left upper quadrant (LUQ, Palmer's point)
- 
- Recommended not to incise too deeply into the abdominal wall, because vascular and bowel wounds caused by the scapel tip have been reported.





Trocar insertion with  
operating table flat

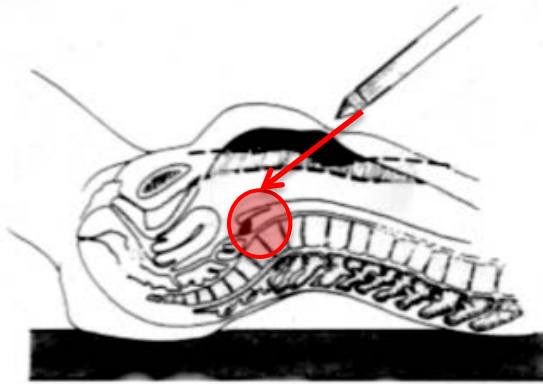


Position of the trocar and  
great vessels in trendelenburg

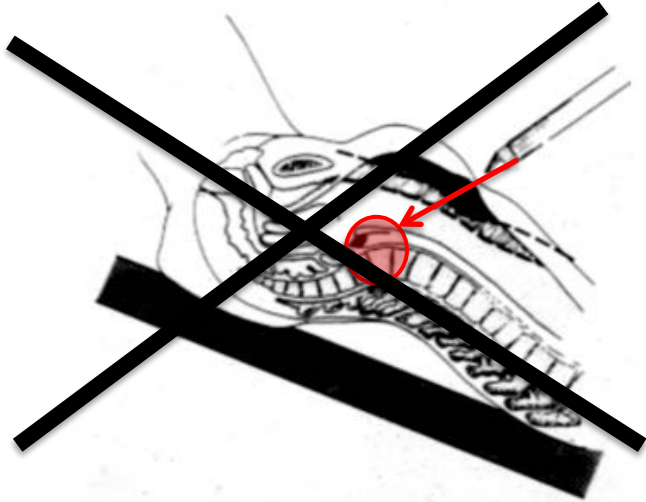
The aortal bifurcation is more frequently caudal in the Trendelenburg (33%), than in the dorsal decubitus (11%) position.

The patient must be placed in the supine dorsal decubitus position (not in the Trendelenburg position)

Nezhat F et al. Laparoscopic appraisal of the anatomic relationship of the umbilicus to the aortic bifurcation. J Am Assoc Gynecol Laparosc 1998;5:135-40



Trocar insertion with operating table flat



Position of the trocar and great vessels in trendelenburg

The aortal bifurcation is more frequently caudal in the Trendelenburg (33%), than in the dorsal decubitus (11%) position.

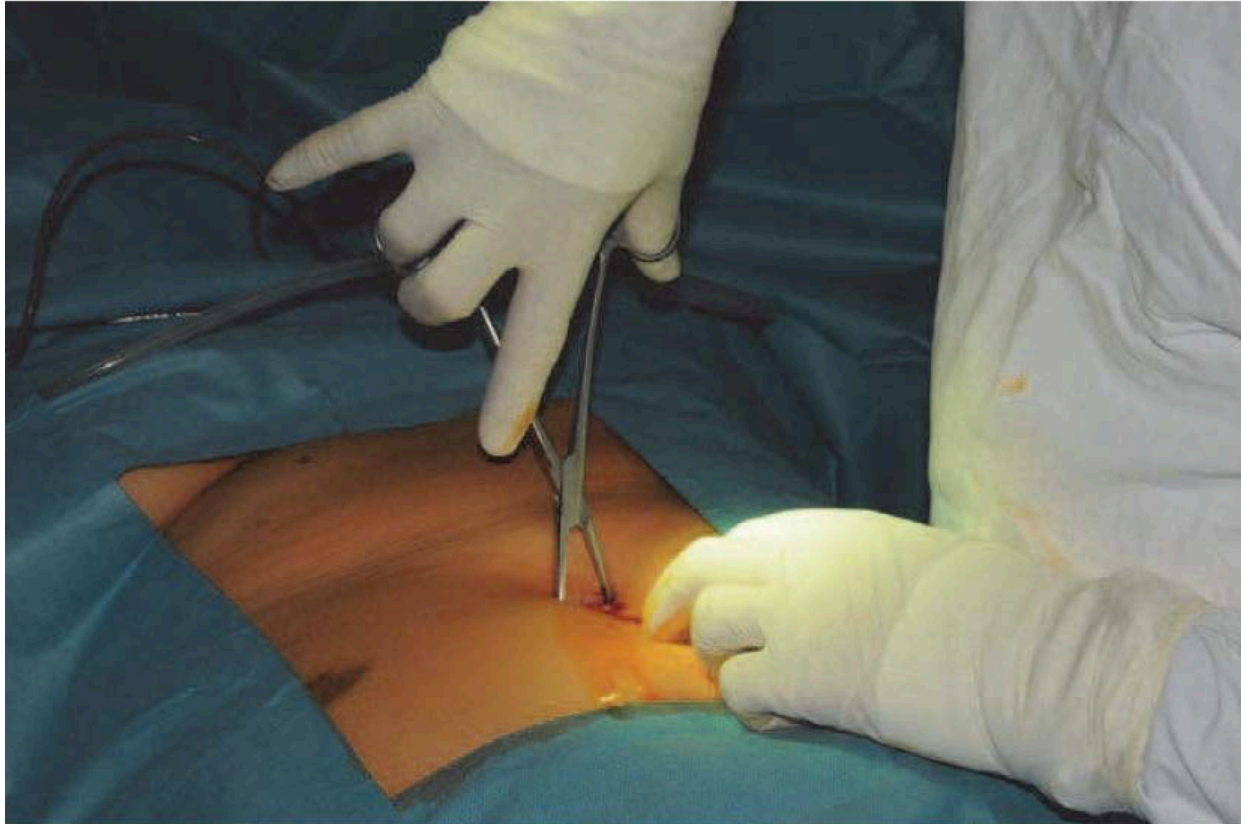
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# Closed conventional trocar entry ( Veress Needle entry )



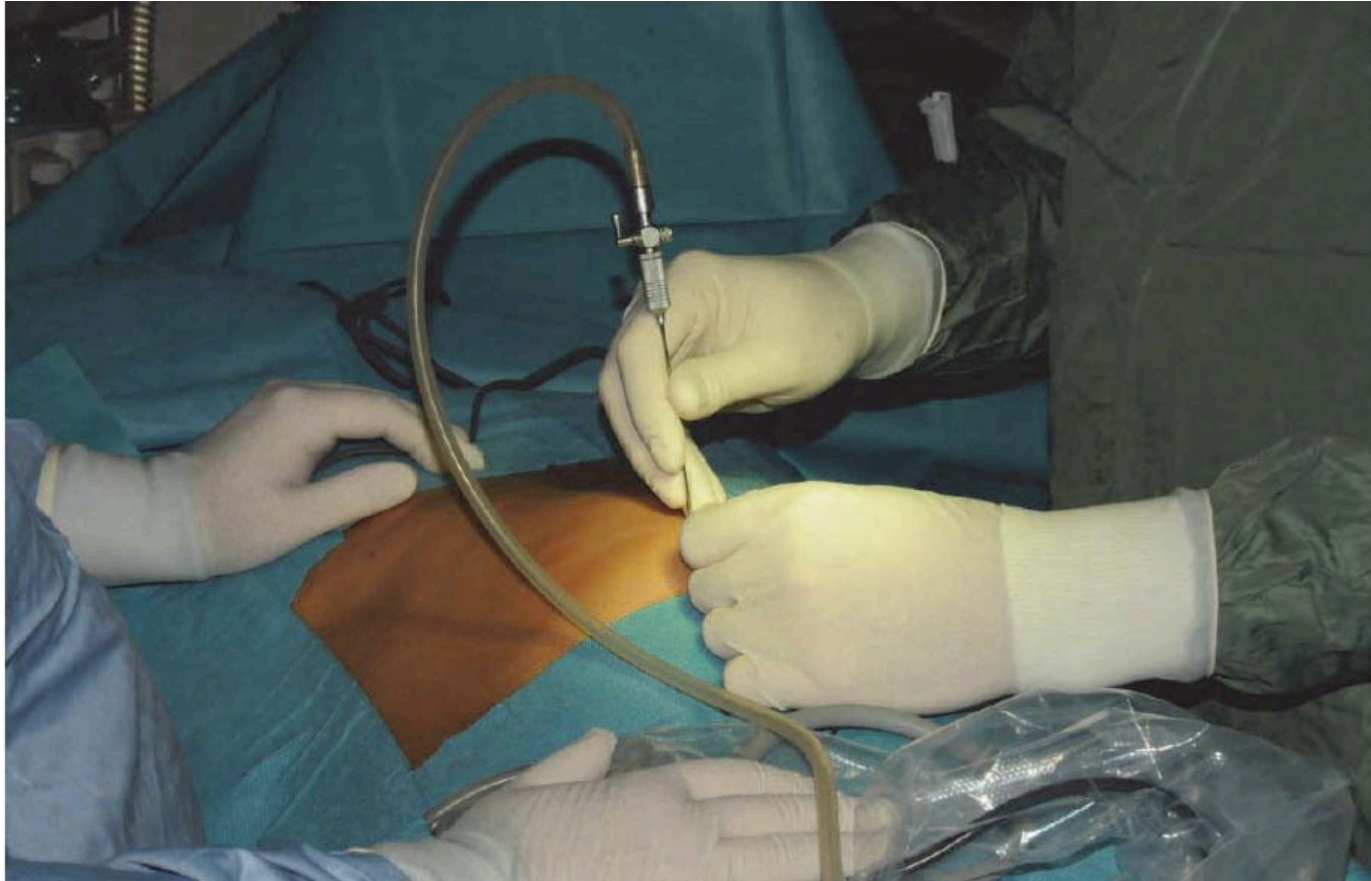
Skin incision in a closed technique

# Closed conventional trocar entry ( Veress Needle entry )



Dissection of the anterior abdominal wall in a closed technique

# Closed conventional trocar entry ( Veress Needle entry )



Veress needle insertion

# Closed conventional trocar entry ( Veress Needle entry )



Blind first trocar insertion in a closed technique

# Closed conventional trocar entry ( Veress Needle entry )



First trocar in its place

- A previous midline laparotomy: ass. with a high risk of intra-peritoneal adhesions
- Higher insufflation and first trocar insertion failure rate
- Higher risk of complications

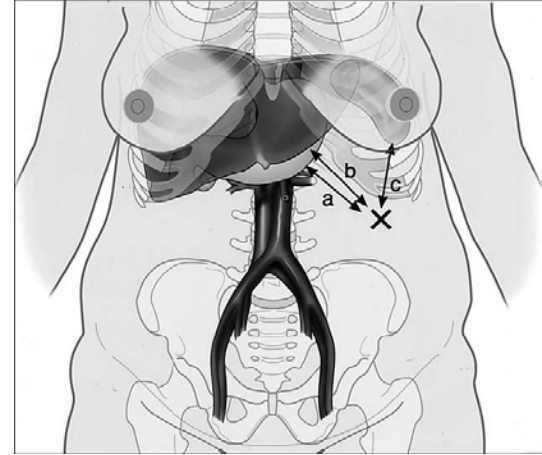
Prevalence of periumbilical adhesions  
(LUQ micro-laparoscopic entry)

| Micro laparoscopy               | No previous surgery<br>N=469 (%) | Previous laparoscopy<br>N=125 (%) | Previous transversal laparotomy<br>N= 131 (%) | Previous midline laparotomy<br>N=89 (%) |
|---------------------------------|----------------------------------|-----------------------------------|---|---|
| Peri-umbilical adhesions        | 0.68                             | 1.6                               | 19.8  | 51.7                                    |
| Severe peri-umbilical adhesions | 0.42                             | 0.8                               | 6.8   | 31.4                                    |

Audebert AJ, Gomel V. Role of microlaparoscopy in the diagnosis of peritoneal and visceral adhesions and in the prevention of bowel injury associated with blind trocar insertion. Fertil Steril 2000;73:631–5

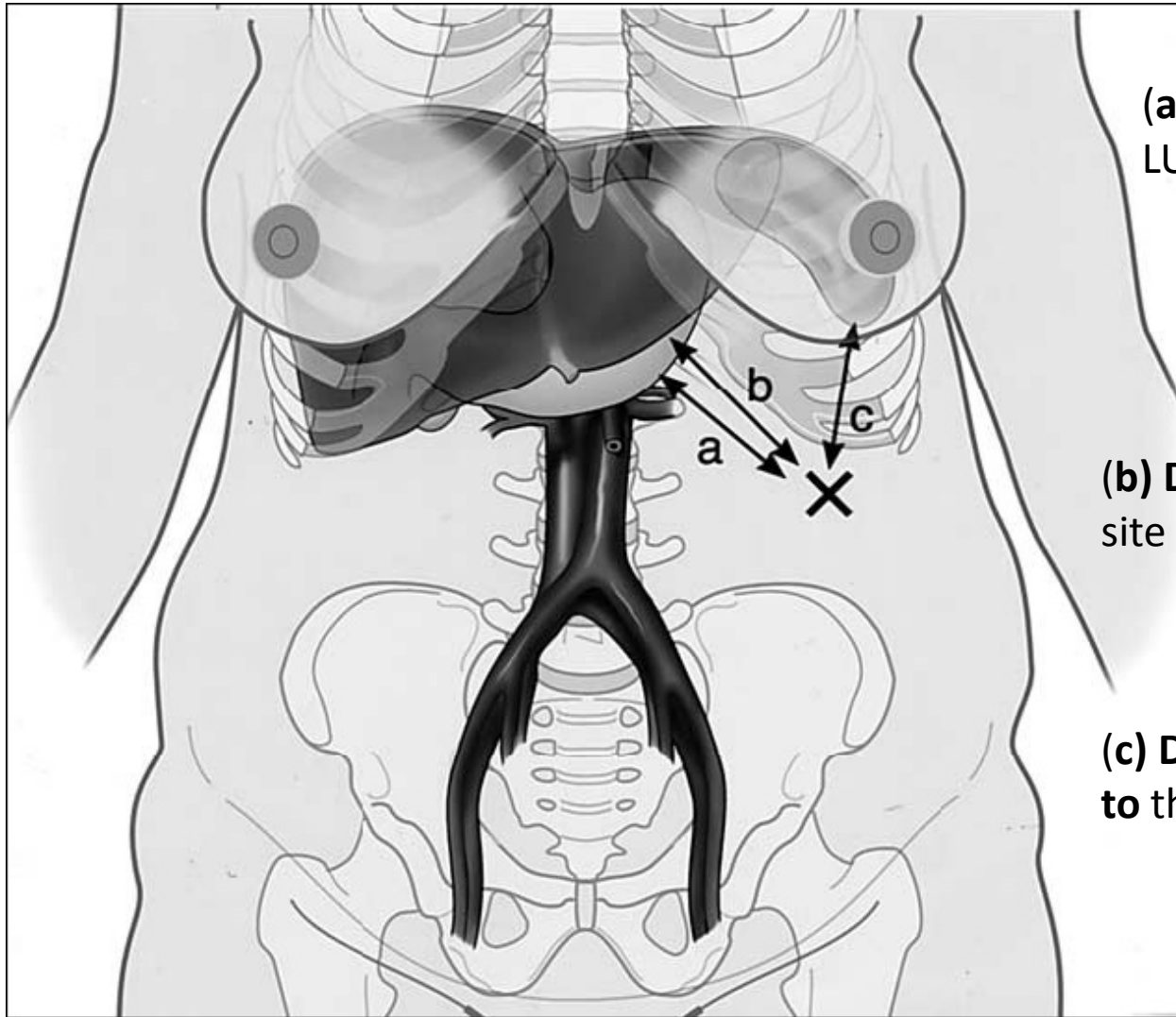


Left upper quadrant (Palmer's Point) cannula insertion site



- Primary insertion of the laparoscopic cannula in the LUQ was first described by Raoul Palmer in 1974
- The exact point of introduction (Palmer's point) is located on the mid-clavicular line (i.e. 2 or 3 finger widths off the upper midline), 4–5 cm below the left costal margin (three finger widths)
- a nearly zero risk of injury to large vessels

Left upper quadrant (Palmer's Point) cannula insertion site



**(a) Distance from LUQ insertion site to stomach.**

**(b) Distance from LUQ insertion site to the liver.**

**(c) Distance from LUQ insertion site to the spleen.**

*Tulikangas. Left upper-quadrant cannula insertion. Fertil Steril 2003;79(2):411-412*

## Left upper quadrant (Palmer's Point) cannula insertion site

- **Indications:**

- Previous laparotomy
- Extremely obese: *the umbilicus is shifted caudally to the aortic bifurcation*
- Very thin patients: *the great vessels lie 1-2 cm underneath the umbilicus*
- Large pelvic mass
- Early 2<sup>nd</sup> trimester pregnancy
- Failed umbilical cannula insertion: 2-3 times

- **Contraindications:**

- Previous splenic or gastric surgery
- Significant hepatosplenomegaly
- Portal hypertension
- Gastropancreatic masses

# Number of Veress needle insertions attempts

- Complication rates were as follows:
  - At 1 attempt : 0.8% to 16.3%
  - At 2 attempts : 16.31% to 37.5%
  - At 3 attempts : 44.4% to 64%
  - at > 3 attempts : 84.6% to 100%.
- Complications were extraperitoneal insufflation, omental and bowel injuries, and failed laparoscopy

Richardson RF et al. Complications of first entry: a prospective laparoscopic audit. *Gynaecol Endosc* 1999;8:327–34

- Failed entry:
  - No universally agreed definition
  - Ranged from 2-3 attempts

Ahmad G et al. Laparoscopic entry techniques. *Cochrane Database of Systematic Reviews* 2012, Issue 2:1-108

## Left upper quadrant (Palmer's Point) cannula insertion site

- LUQ insufflation requires emptying of the stomach by nasogastric suction
- Introduction of the Veress needle perpendicularly to the skin
- Complications: injuries to the spleen and the stomach
- Teoh et al. reports on the case of one serious gastric injury (3/1000), despite the systematic use of nasogastric aspiration

Teoh B et al. An evaluation of four tests used to ascertain Veres needle placement at closed laparoscopy.  
J Minim Invasive Gynecol 2005;12:153–8.

# Laparoscopic entry systems

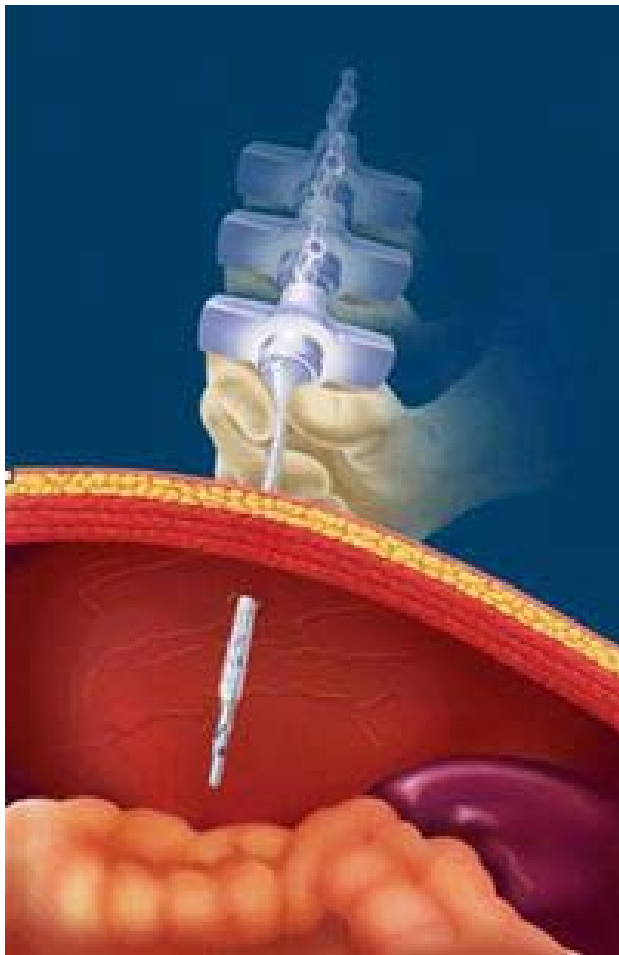
## Closed Technique

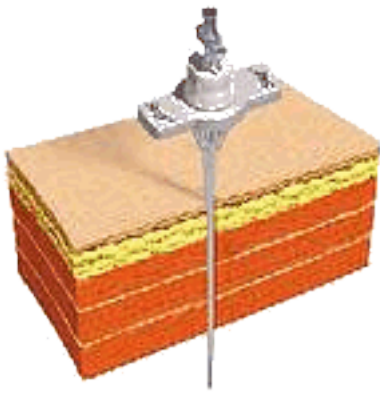
- *Blind Non-Visual Entry*
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## Open Technique

- Hassan trocar entry

# Radially expanding trocar entry

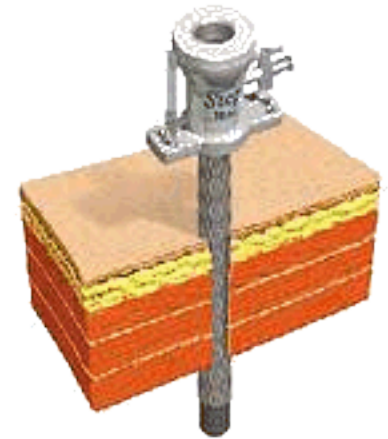




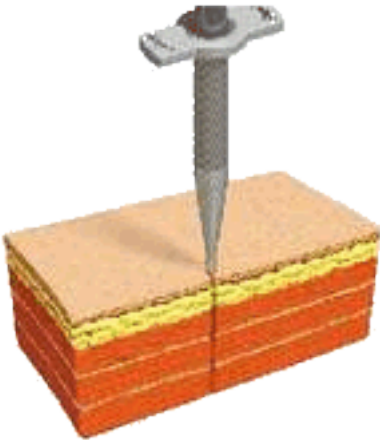
Needle and Sleeve



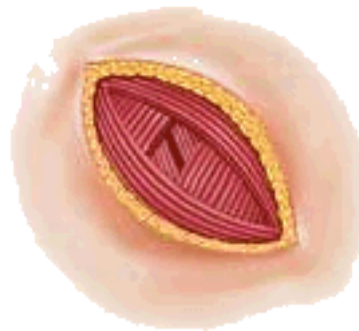
Dilating Sleeve



Fixed Cannula



just dilating muscle layers



Trocars cut or tear through sequential muscle layers depending on tip design





# Radially expanding trocar entry

- Step, InnerDyne, Sunnyvale, CA was introduced in 1994
  - It consists of a 1.9 mm Veress surrounded by an expanding polymeric sleeve.
  - The abdomen may first be insufflated using the Veress needle.
  - The needle is removed, and the sleeve acts as
  - a tract through the abdominal wall that can be dilated up to 12 mm by inserting a blunt obturator with a twisting motion

Turner DJ. Making the case for the radially expanding access system.  
Gynaecol Endosc 1999;8:391–5

# Port site hernia

- 3,735 Radially Expanded Access (REA) Trocar Sites in 747 bariatric surgery patients
- January 2002 to April 2005
- No fascial closure
- Compare with 747 Hasson technique; figure-of-eight #1 Polysorb closure
  - 0/3,735 (0%) hernias in REA sites
  - 10/747 (1.34%) hernias at Hasson site

# Laparoscopic entry systems

## Closed Technique

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## Open Technique

- Hassan trocar entry

# Direct trocar insertion without prior pneumoperitoneum

- Seemed to be far more dangerous than other methods , but in reality it is considered as a relatively safe alternative for a closed laparoscopic access, when performed properly
- The aim of this technique is to minimize complications related to the insertion of the Veress needle such as gas embolism

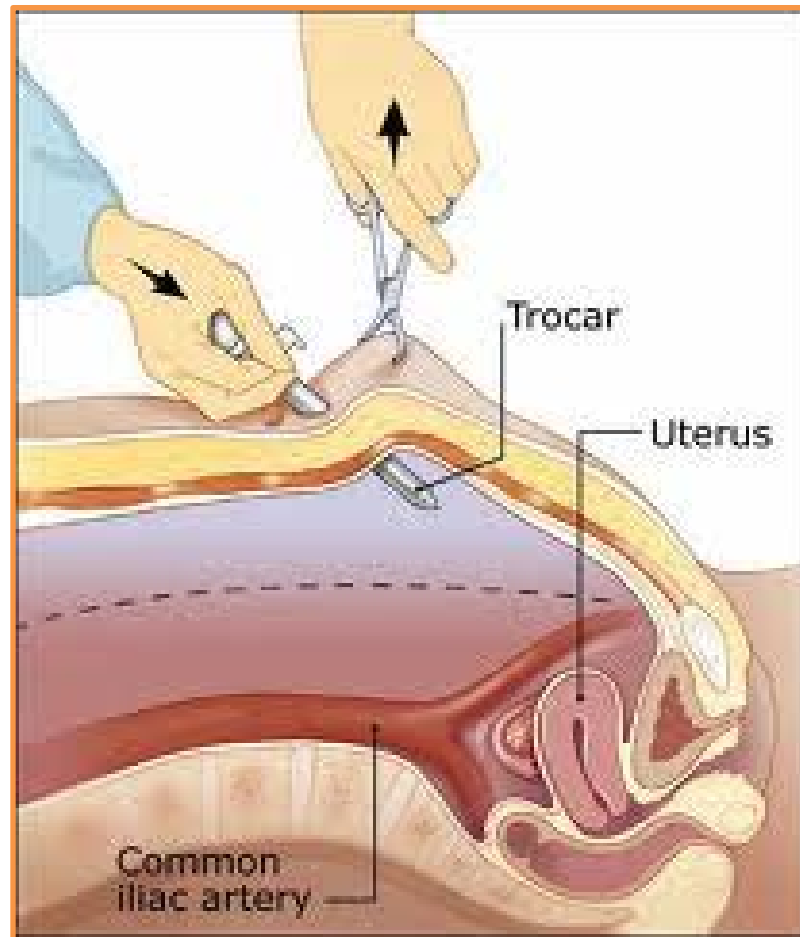
# Key steps

- Only one blind step (trocar)
- Instead of three (Veress needle, insufflation, trocar).
- The direct entry method is faster than any other method of entry
- However, it is the least performed laparoscopic technique in clinical practice today

# Key steps

- A skin incision, most often below the umbilicus
- Lifted the abdominal wall with a hand or clamps
- Inserted trocar and identify the layers
- The diameter of 1<sup>st</sup> inserted trocar: 5-10 mm
- The crucial point: the sharpness and quality of trocar, knowing the layers, and practice

# Direct sharp trocar entry



- Relative Contraindications:
  - Previous laparotomy
  - A large pelvic mass
  - An advanced state of pregnancy
- To date, numerous studies have been published on this subject. No increase in the number of complications related to the absence of initial pneumoperitoneum has been revealed in these different studies.
- The rate of serious injury (serious vascular or bowel injury) is estimated to be 0.4/1000, which is equivalent to that reported for the classical closed entry technique



# Laparoscopic entry systems

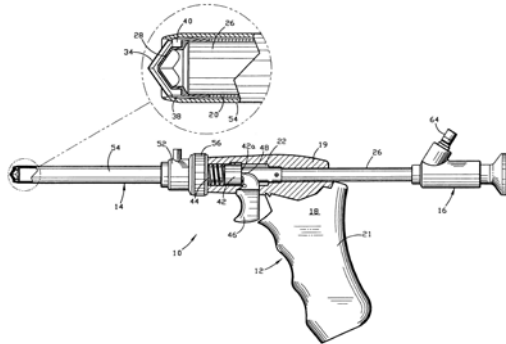
## Closed Technique

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## Open Technique

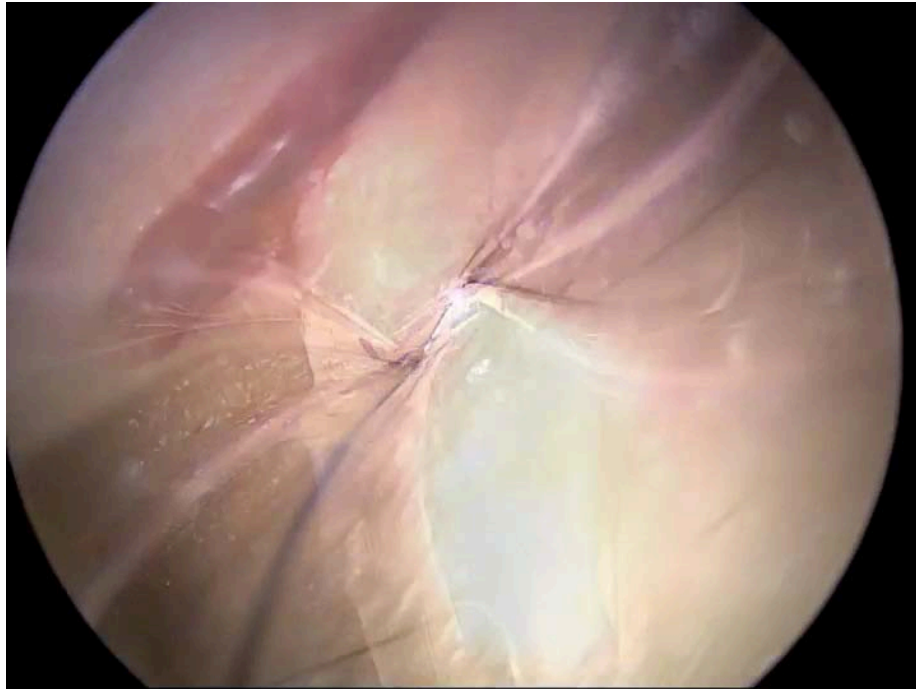
- Hassan trocar entry

## Direct optical access trocar



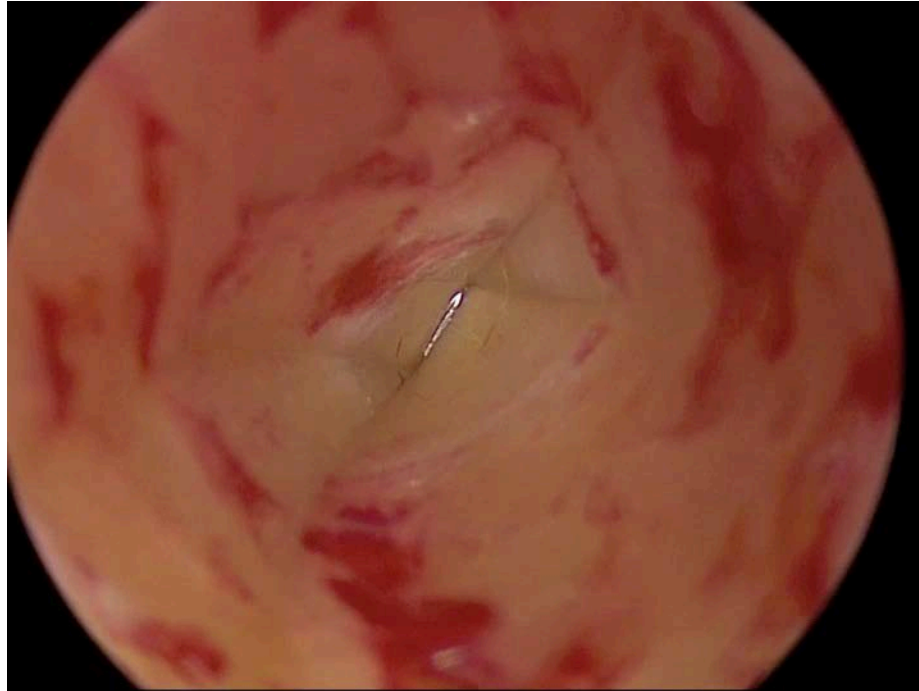
- The use of an optical trocar without prior pneumoperitoneum is an alternative described by several series in the surgical treatment of obesity
- A primary port is the first entry site through which a lens, 0 degree camera and light is introduced

# Direct optical access trocar



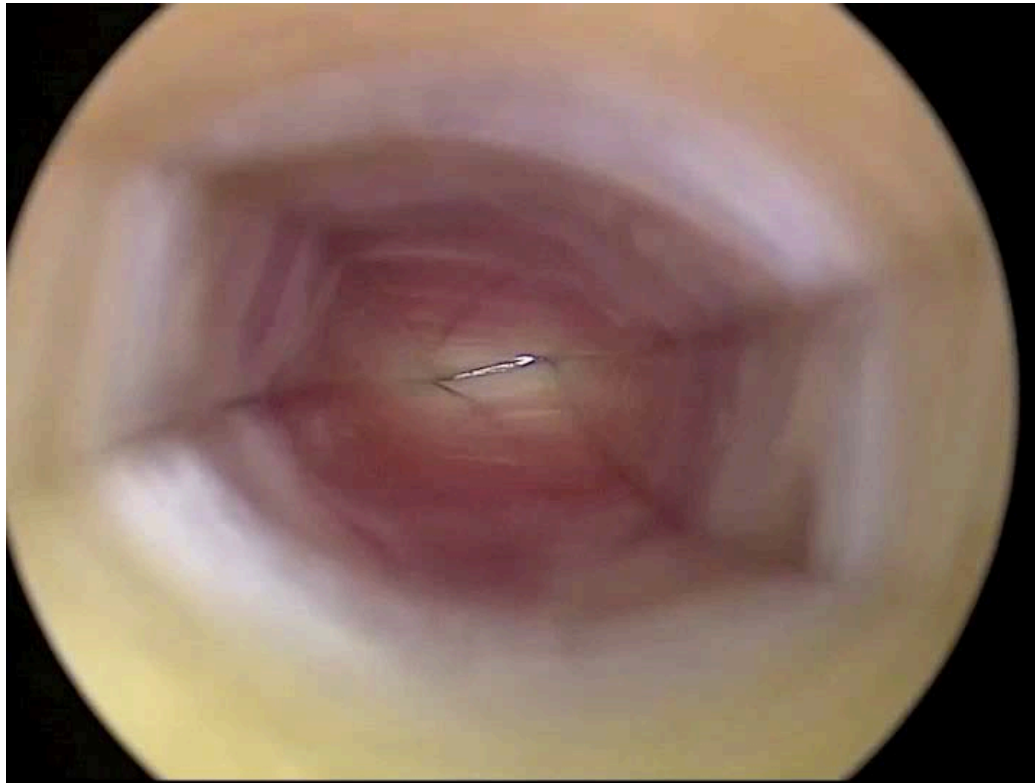
*Entry with an optical trocar*

# Direct optical access trocar



*Fatty layer of the abdominal wall*

# Direct optical access trocar



*Outer fascial layer and muscle layer*

# Direct optical access trocar



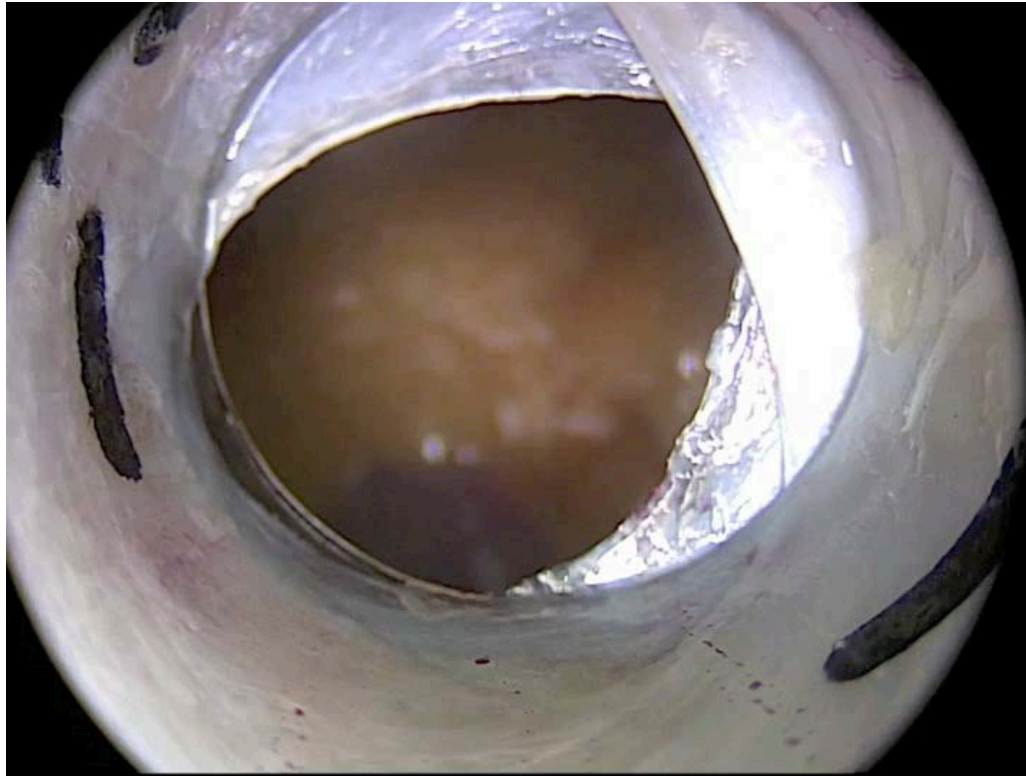
*Inner fascial layer*

# Direct optical access trocar



*Peritoneal entry*

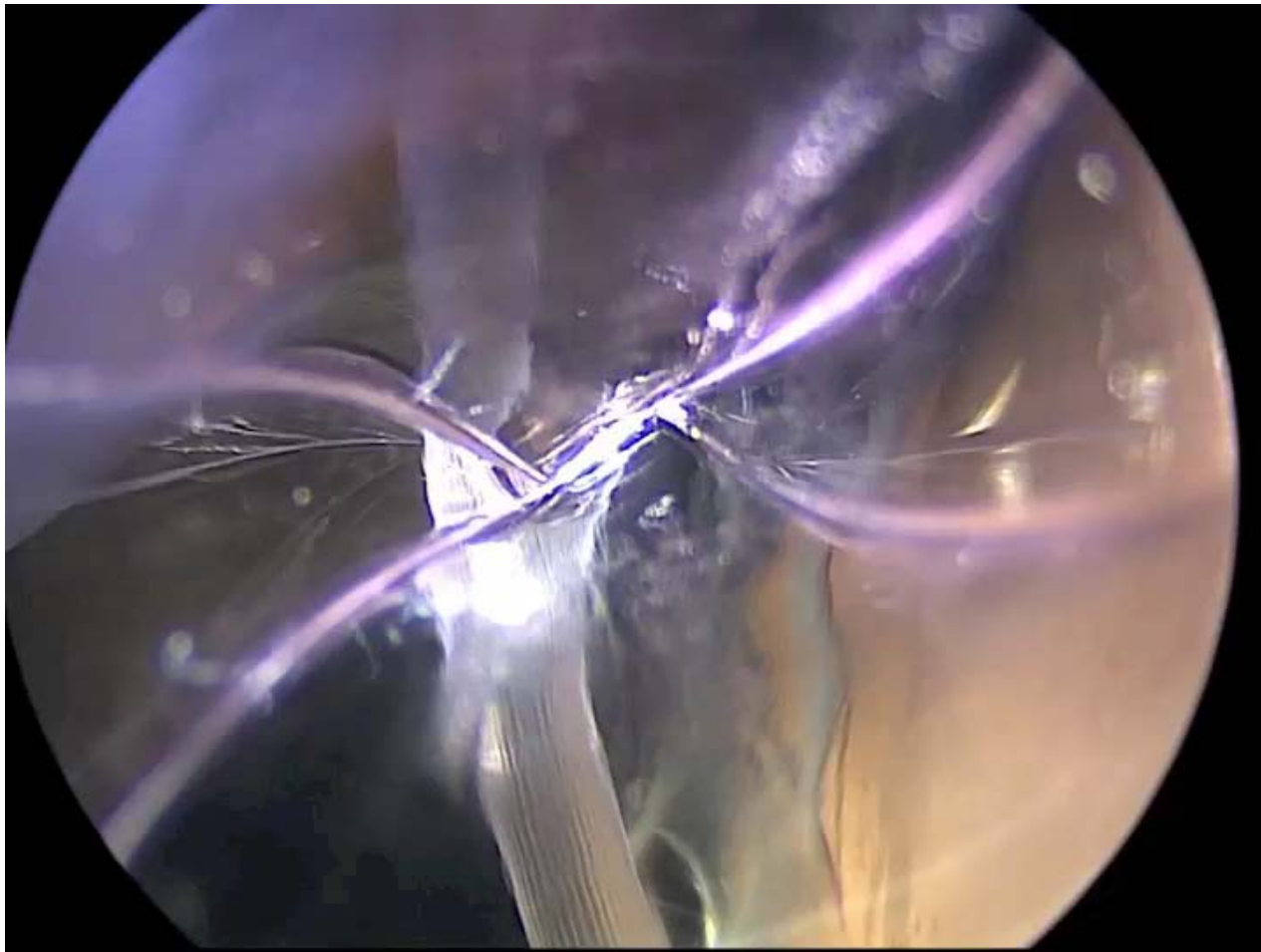
# Direct optical access trocar



*Confirmation of peritoneal entry after removal of the optical trocar sheath*



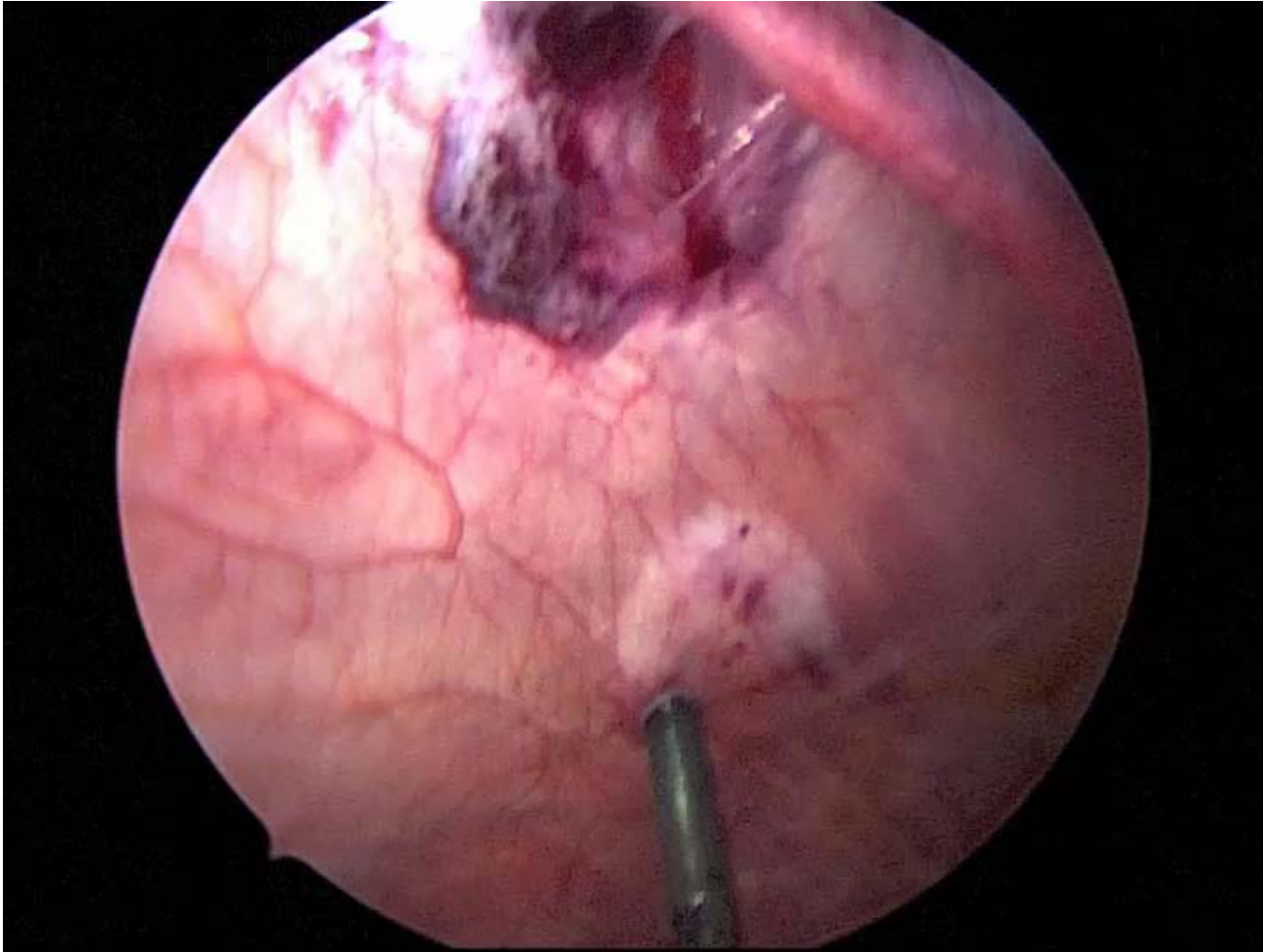
# Direct optical trocar entry technique



# Closed the trocar defect



# Closed the trocar defect



# Port site hernia

- 3,744 Visual Entry Trocar (VET) Sites in 844 bariatric surgery patients
- July 2000 to December 2003
- Five 12 mm; two 5 mm
- no fascial closure
  - 2/3,744 (0.2%) hernias

# Laparoscopic entry systems

## Closed Technique

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## Open Technique

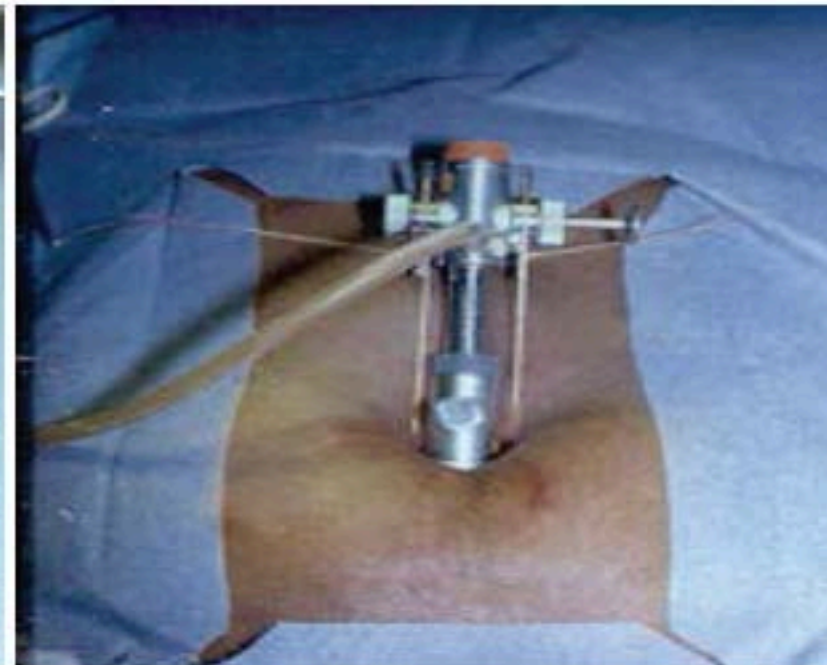
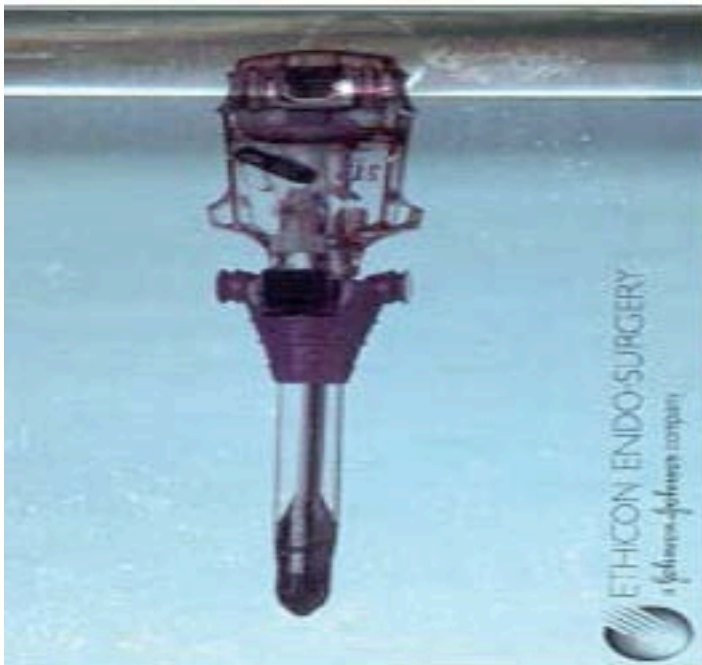
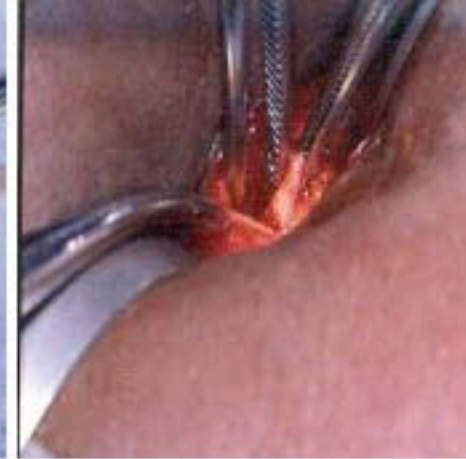
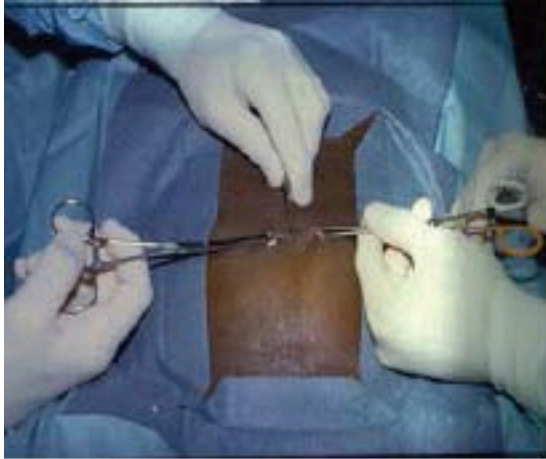
- **Hassan trocar entry**

# Open laparoscopic access (Hasson technique)

- First described in 1970



# Open laparoscopic access (Hasson technique)



# Objective

- Describe different techniques for primary trocar entry
- Interpret the data regarding techniques of laparoscopic abdominal entry



## Occurrence of vascular and bowel complications, whatever the technique used for laparoscopic insertion (studies of >5000 procedures for gynaecologic indications)

| Author       | Year | Number of cases | Methods                         | Bowel injury |           | Vascular injury |           |
|--------------|------|-----------------|---------------------------------|--------------|-----------|-----------------|-----------|
| Harki Sirren | 1999 | 10,2812         | Retrospective study             | 29           | 0.4/1000  | 6               | 0.1/1000  |
| Dubuisson    | 1999 | 8324            | Retrospective study             | 3            | 0.4/1000  | 6               | 0.7/1000  |
| Chapron      | 1998 | 29,966          | Retrospective study             | 14           | 0.5/1000  | 6               | 0.2/1000  |
| Woolcott     | 1997 | 6173            | Retrospective study             | 5            | 0.8/1000  | 0               | 0         |
| Jansen       | 1997 | 25,764          | Retrospective study             | 24           | 0.9/1000  | 47              | 1.8/1000  |
| Wherry       | 1996 | 5215            | Retrospective study             | 4            | 0.7/1000  | 0               | 0         |
| O'Callaghan  | 1996 | 6417            | Retrospective study             | 1            | 0.15/1000 | 1               | 0.15/1000 |
| Querleu      | 1993 | 17,521          | Retrospective/prospective study | 7            | 0.4/1000  | 4               | 0.2/1000  |
| Patel        | 1985 | 8600            | Retrospective study             | 1            | 0.1/1000  | 0               | 0         |
| Penfield     | 1984 | 10,840          | Retrospective study             | 6            | 0.5/1000  | 0               | 0         |
| Phillips     | 1984 | 125,162         | Retrospective study             | 53           | 0.4/1000  | 56              | 0.4/1000  |
| Mintz        | 1977 | 99,204          | Retrospective study             | 31           | 0.3/1000  | 43              | 0.4/1000  |
| Total        | -    | 523,602         | -                               | 287          | 0.5/1000  | 205             | 0.4/1000  |

Position of severe vascular injuries (large vessels) occurring during laparoscopic insertion (whatever the entry technique).

| Author     | Year | Vascular injuries (n) | Aorta    | Inferior vena cava | Iliac artery | Iliac vein | Mesenteric vessel | No precision |
|------------|------|-----------------------|----------|--------------------|--------------|------------|-------------------|--------------|
| Chapron    | 2000 | 19                    | 5        | 6                  | 8            | 3          | 3                 | 0            |
| Fuller     | 2005 | 25                    | 11       | 3                  | 4            | 1          | 3                 | 3            |
| Chandler   | 2001 | 271                   | 37       | 25                 | 106          | 51         | 52                | 0            |
| Soderstrom | 1997 | 47                    | 6        | 5                  | 30           | 0          | 4                 | 0            |
| Total      | -    | 362                   | 59 (16%) | 39 (11%)           | 158 (41%)    | 55 (15%)   | 62 (17%)          | 3 (0.8%)     |

# Severe vascular complications depending on the technique used for laparoscopic insertion

| Author     | Year | Methods                     | Veress needle and trans-umbilical blind trocar | Open                 | Direct trocar insertion |
|------------|------|-----------------------------|--|----------------------|-------------------------|
| Ostrzenski | 1999 | Prospective study           | 0/200  | -                    | -                       |
| Decloedt   | 1997 | Prospective study           | -  | 0/90                 | -                       |
| Hasson     | 2000 | Retrospective study         | -  | 0/5284               | -                       |
| Cravello   | 2002 | Retrospective study         | -  | 0/1562               | -                       |
| Yerdel     | 1999 | Randomized controlled trial | 1/470  | -                    | 0/1030                  |
| Querleu    | 1993 | Retrospective study         | 4/17,521                                       | -                    | -                       |
| Agresta    | 2004 | Randomized controlled trial | 0/323  | -                    | 0/275                   |
| Tinelli    | 2009 | Randomized controlled trial | 0/101  | -                    | 0/93                    |
| Jansen     | 2004 | Retrospective study         | 25/51,559                                      | 1/579                | -                       |
| Le Tohic   | 2007 | Retrospective study         | -  | -                    | 0/1258                  |
| Nezhat     | 1991 | Randomized controlled trial | 0/100  | -                    | 0/100                   |
| Molloy     | 2002 | Meta-analysis               | 8/132.851 (0.06/1000)                          | 1/21.292 (0.05/1000) | 0/16.739 (0/1000)       |

# Prevalence of bowel injuries

depending on the laparoscopic insertion technique  
(number of injuries/number of procedures)

| Author     | Year | Methods                     | Veress needle and blind trans-umbilical trocar | Open                 | Direct trocar insertion |
|------------|------|-----------------------------|--|----------------------|-------------------------|
| Ostrzenski | 1999 | Prospective study           | 0/200  |                      |                         |
| Decloedt   | 1997 | Prospective study           | -  | 1/90                 | -                       |
| Hasson     | 2000 | Retrospective study         | -  | 1/5284               | -                       |
| Cravello   | 2002 | Retrospective study         | -  | 2/1562               | -                       |
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| Le Tohic   | 2007 | Retrospective study         | -  | -                    | 0/1258                  |
| Nezhat     | 1991 | Randomized controlled trial | 0/100  | -                    | 0/100                   |
| Molloy     | 2002 | Meta-analysis               | 49/134.917 (0.4/1000)                          | 23/21.547 (1.1/1000) | 9/16.739 (0.5/1000)     |

Randomized trials comparing the prevalence of severe complications (vascular or bowel injury) during first trocar insertion with the closed insertion technique (Veress needle insufflation and blind first trocar), compared with direct trocar insertion

| Author       | Year | Methods                     | Veress needle and blind trans-umbilical trocar (n. cases/n. procedures) | Direct trocar insertion (n. cases/n. procedures) | <i>P</i> (Fisher test) |
|--------------|------|-----------------------------|---|--|------------------------|
| Borgatta     | 1990 | Randomized controlled trial | 0/110   | 1/102  | 0.37                   |
| Agresta      | 2004 | Randomized controlled trial | 4/323   | 0/275  |                        |
| Byron        | 1993 | Randomized controlled trial | 0/126   | 0/126  |                        |
| Dabirashrafi | 1994 | Randomized controlled trial | 0/378   | 0/378  |                        |
| Nezhat       | 1991 | Randomized controlled trial | 0/100   | 0/100  |                        |
| Total        |      |                             | 4/1037  | 1/981  |                        |

# Cochrane Review

## Primary port entry

- Open entry vs Closed entry technique
- Primary outcomes
  - No significant difference for vascular and visceral injury
- Secondary outcomes
  - No significant difference for extraperitoneal insufflation, trocar site bleeding and infection or injury to the mesentery

# Cochrane Review

## Primary port entry

- Direct trocar entry vs Closed entry technique
- Primary outcomes
  - No significant difference for vascular and visceral or solid organ injury
  - *A reduction in failed entry with direct trocar technique (OR 0.21, 95% CI 0.14 to 0.31, Five RCTs)*
- Secondary outcomes
  - *Significant reduction in rates of extraperitoneal insufflation and omental injury ass. With direct trocar technique (OR 0.18, 95% CI 0.13 to 0.26, Meta-analysis)*

# Cochrane Review

## Primary port entry

- Direct vision entry vs Closed entry technique
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  - No significant difference for vascular and visceral injury
- Secondary outcomes
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# Cochrane Review

## Primary port entry

- Direct vision entry vs Closed entry technique
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- Secondary outcomes
  - No significant difference for extraperitoneal insufflation, trocar site bleeding and infection or injury to the mesentery



# Cochrane Review

## Primary port entry

- Direct vision entry vs Open entry technique
- Primary outcomes
  - No significant difference for vascular and visceral injury
- Secondary outcomes
  - No significant difference for extraperitoneal insufflation, trocar site bleeding and infection or injury to the mesentery

# Cochrane Review

## Primary port entry

- Radially expanding trocar vs standard trocars
- Primary outcomes
  - No significant difference for vascular, visceral and solid organ injury or gas embolism
- Secondary outcomes
  - *Significant reduction in trocar site bleeding with radially expanding trocar. OR 0.31 (95% CI 0.15 to 0.62, three RCT)*

# Summary of main results

- “On the basis of evidence investigated in this review, there appears to be no evidence of benefit in terms of safety of one technique over another.”
- The low rate of reported complications associated with laparoscopic entry and the small number of participants within the included studies may account for the lack of significant difference in terms of major vascular and visceral injury between entry techniques

# Implications for research

- Randomized controlled trials of adequate power are required to detect a significant reduction in risks of major complications.
- Further well designed randomized controlled trials are required to determine the optimal entry technique in patients with extreme BMI and those with previous abdominal and pelvic surgery

- In order to demonstrate 33% reduction with 80% power and 95% confidence, **a study would need >800,000 cases**

A Consensus Document Concerning Laparoscopic Entry Techniques:  
Middlesbrough, March 19-20, 1999

# Best Access to the Abdomen

**LOYOLA  
MEDICINE**



Bipan Chand, MD

FACS, FASGE, FASMBS

Associate Professor

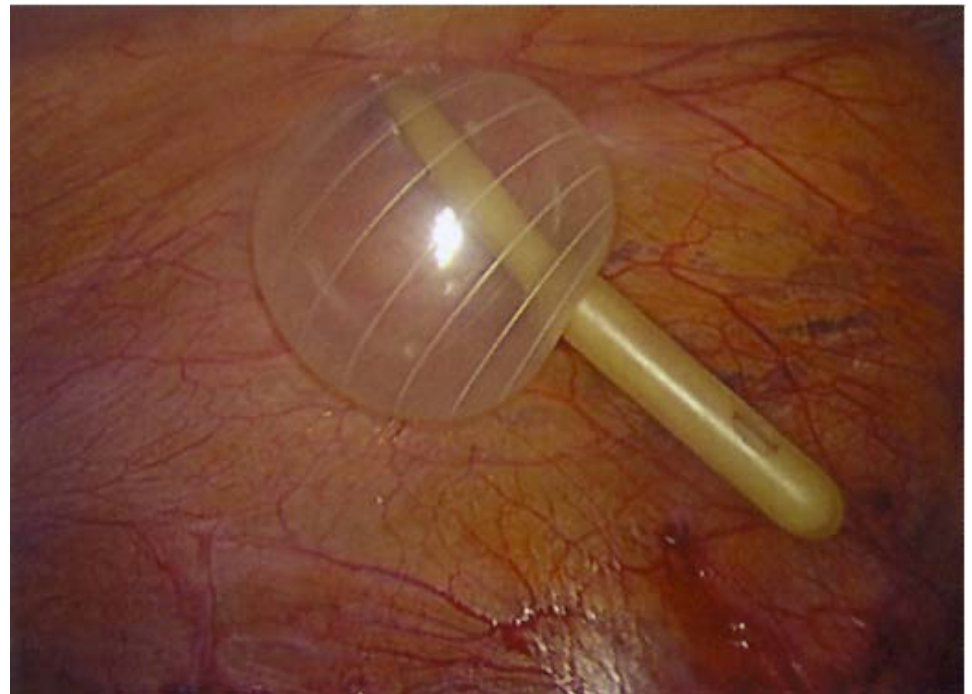
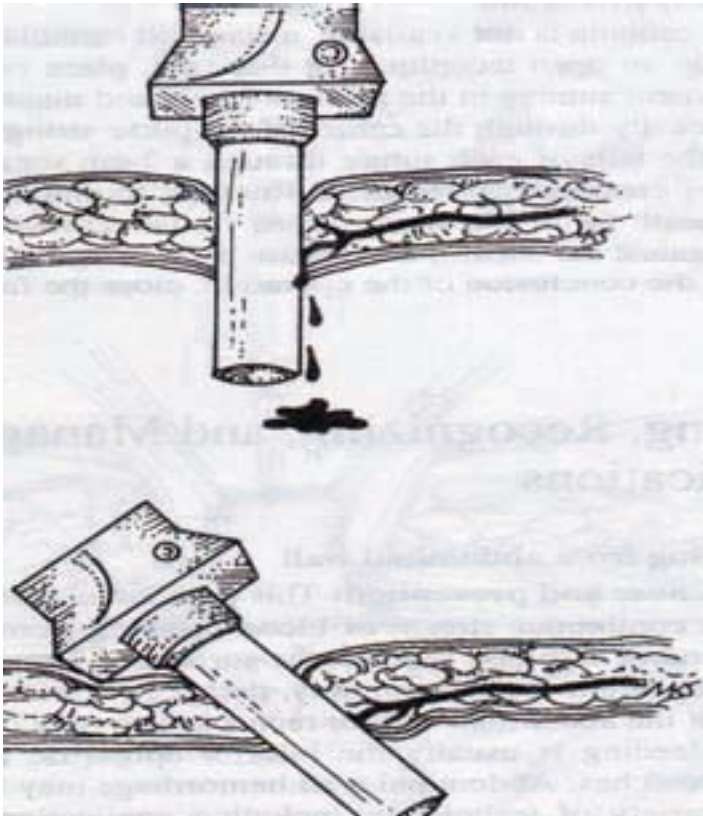
Chief of Minimally Invasive Surgery

*Loyola University Chicago*

*Stritch School of Medicine*

*Chicago*

# Abdominal wall vessels bleeding and management



# Trocar site bleeding and management





# First-line techniques to be used

- In the absence of a previous laparotomy or specific risk factors (obesity, gauntness, large pelvic mass or pregnancy):
  - Closed conventional trocar entry
  - LUQ entry
  - Directed trocar entry
  - Optical trocar entry
  - Open (Hasson) trocar entry
- The currently existing trials do not allow one or another of these techniques to be preferred

# Obesity

- Direct optical trocar
- Veress needle insufflation in the LUQ (Palmer's point)
- There is no existing comparative study between the blind reference technique and the LUQ entry or the optical trocar, in this population of obese

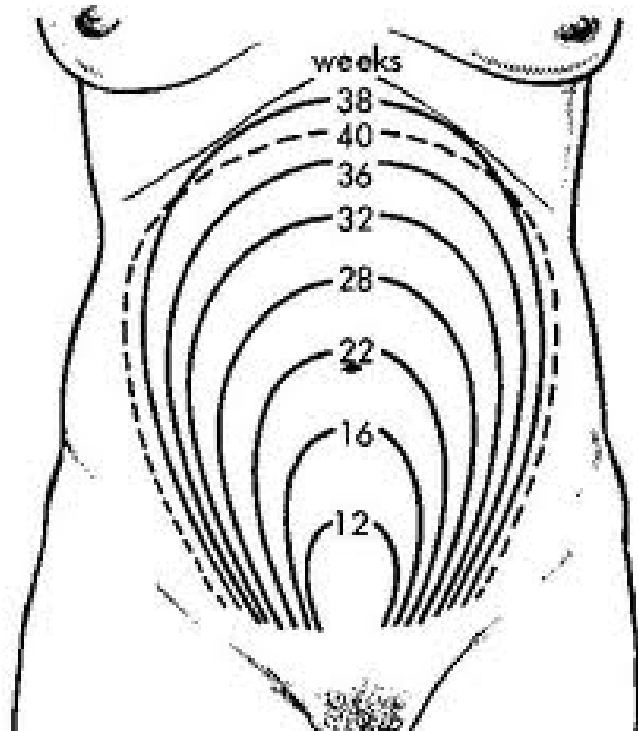
# Slimness

- Open (Hasson) trocar technique
- Veress needle insufflation in the LUQ  
(Palmer's point)
- Trans-umbilical (blind or open) laparoscopic entry in a slim woman must be associated with care, as a result of the proximity of the large vessels
- In the absence of pneumoperitoneum, the distance between the skin surface and the aorta can be 2.5 cm

# Previous midline laparotomy

- Optical trocar entry
- Veress needle insufflation in the LUQ (Palmer's point)
- Open trocar entry at a distance from the existing scars

# Pregnant women



- Laparoscopy is possible during the first and second quarters of pregnancy
- The uterus reaches and then increases in size beyond the level of the umbilicus, between 20 and 24 weeks of gestation (WG)
- The insertion position of the first laparoscopic trocar during pregnancy will need to be adapted according to the volume of the uterus

# Pregnant

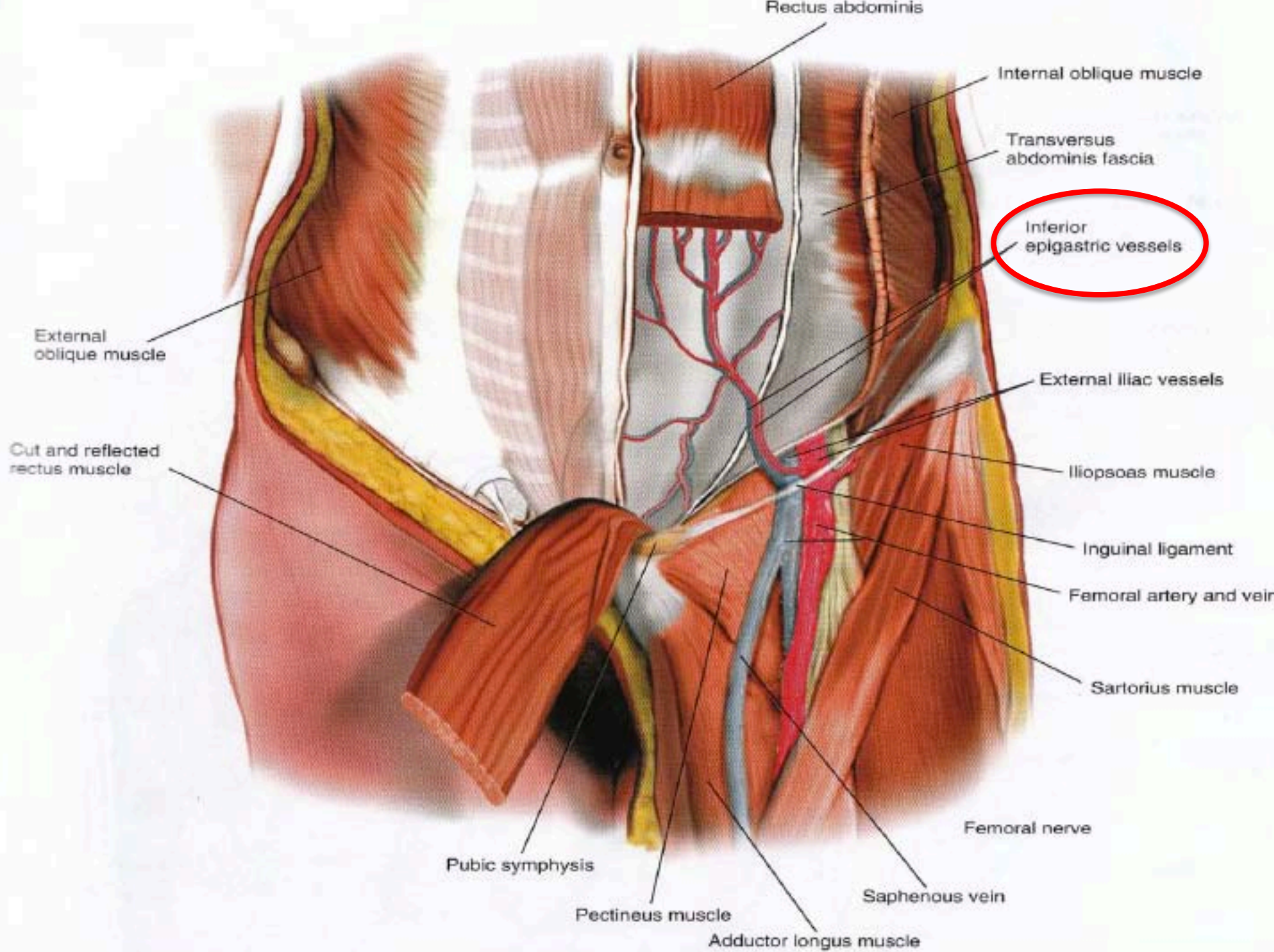
- Starting from 14 WG, trans-umbilical Veress needle insufflation is contraindicated
  - open laparoscopy (using the trans-umbilical or supra-umbilical routes, depending on the volume of the uterus)
  - Micro-laparoscopy via the LUQ (Palmer's point)
- 
- the insufflation pressure must be maintained at a maximum of 12 mm Hg
  - After 24 WG, if laparoscopy is performed, it is recommended to apply open laparoscopy, above the level of the umbilicus

# Prevention of injuries to the epigastric vessels

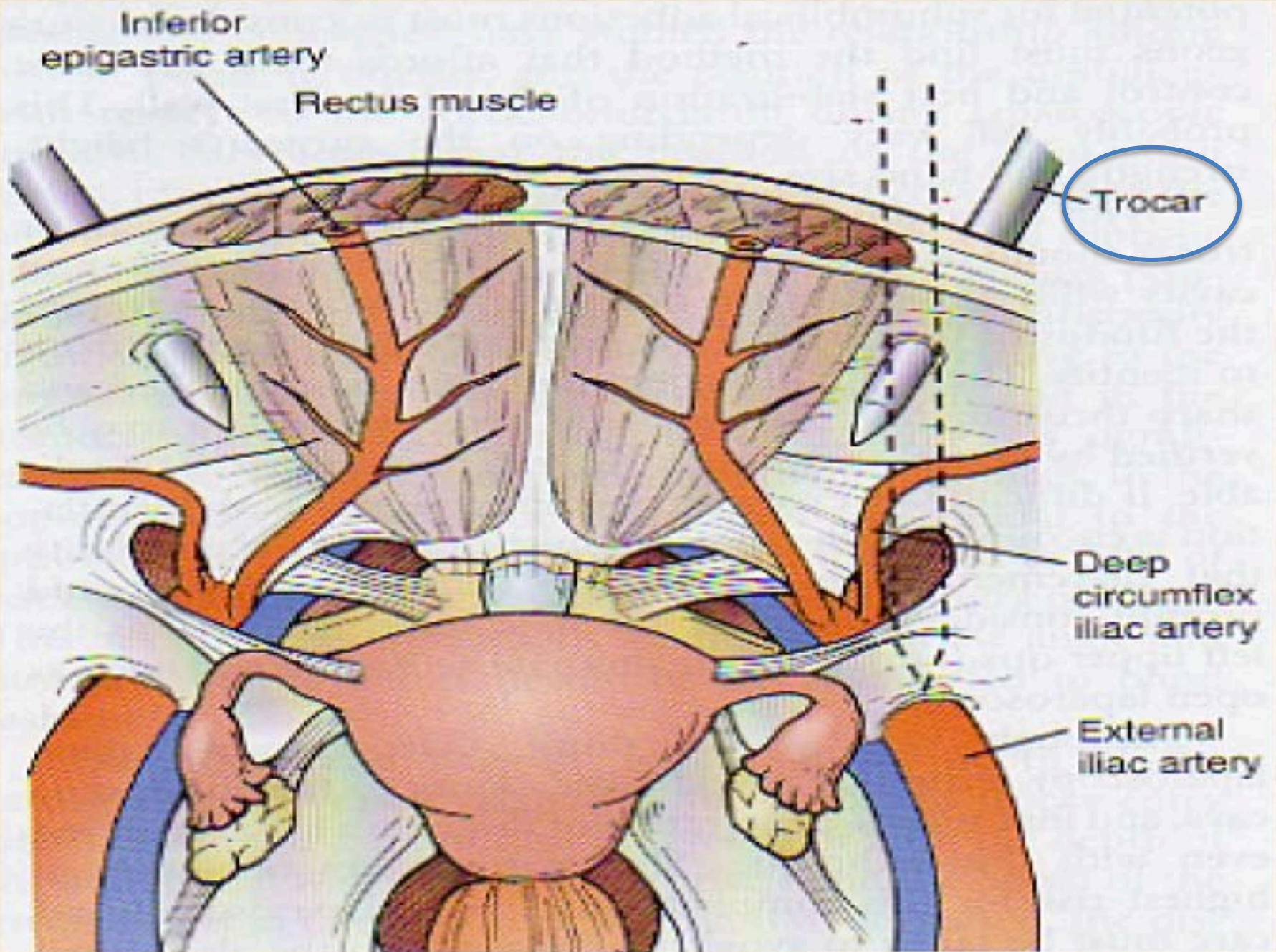
- Transillumination allows the superficial branches of the inferior epigastric vessels to be visualized in 64% of cases.
- Obesity together with a darker skin color lead to a significant decrease in the visualization rate of the inferior epigastric vessels using transillumination. Laparoscopic viewing of the inferior epigastric vessels is possible in 45% of cases .
- In summary, it is recommended to try to visualize the superficial branches of the inferior epigastric vessels using transillumination, and their main trunk by laparoscopic viewing

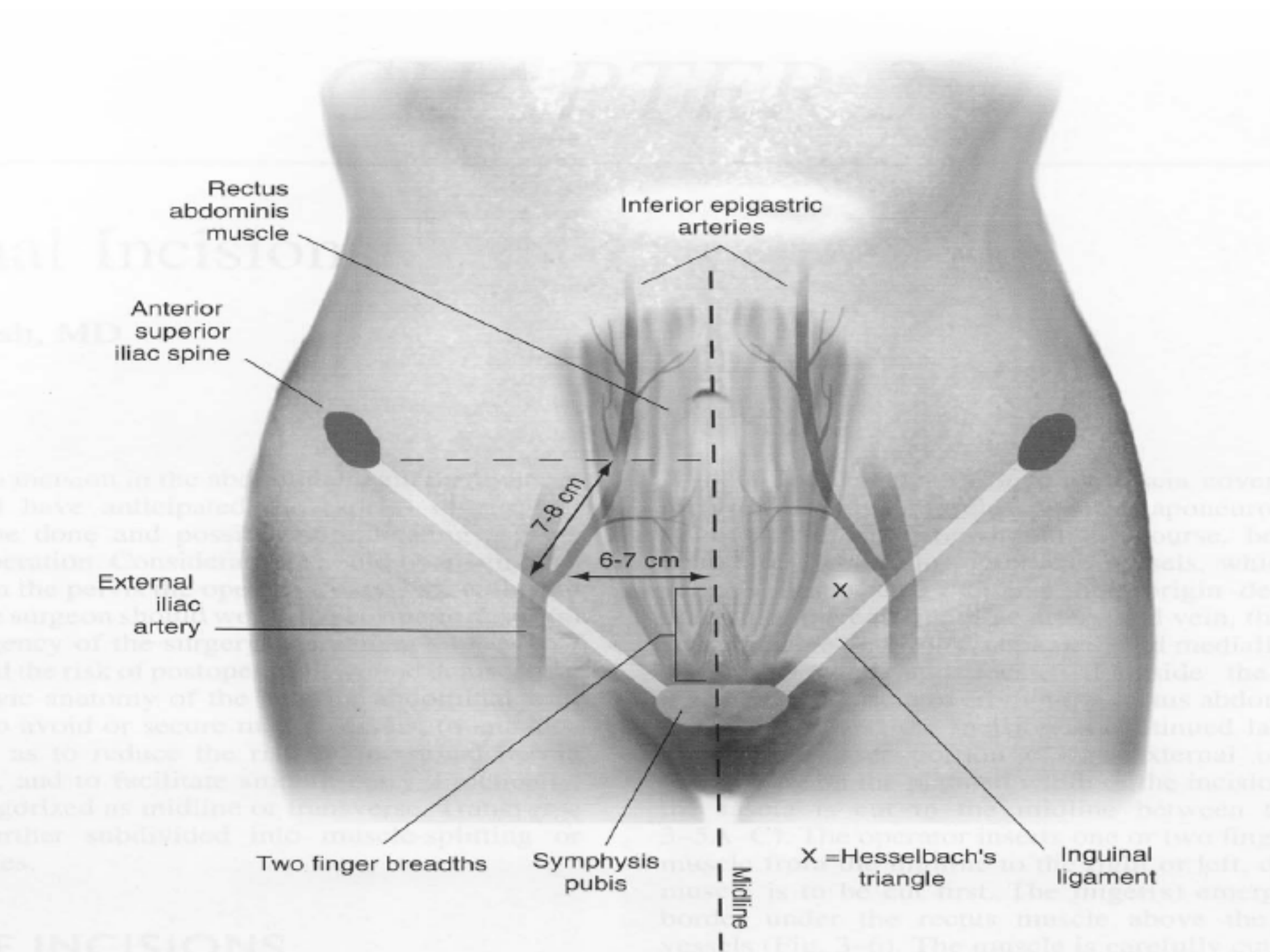
Epstein J et al. Surface anatomy of the inferior epigastric artery in relation to laparoscopic injury. *Clin Anat* 2004;17:400–8.

Hurd WW et al. Visualization of the epigastric vessels and bladder before laparoscopic trocar placement. *Fertil Steril* 2003;80:209–12.









# Anterior Abdominal Wall Anatomy

## Anatomic Landmark Lateral to Midline

|                       | Inferior Epigastric Vessel | Superficial Epigastric Vessel | Superficial Circumflex Iliac | Lateral Margin of Rectus Muscle |
|-----------------------|----------------------------|-------------------------------|------------------------------|---------------------------------|
| 3 cm above symphysis  | 5.6 +/- 1.0 cm             | 5.5 +/- 2.0 cm                | 8.5 +/- 1.0 cm               |                                 |
| 5 cm above symphysis  | 5.2 +/- 1.2 cm             | 5.2 +/- 1.8 cm                | 9.5 +/- 1.6 cm               |                                 |
| 16 cm above symphysis | 4.6 cm                     | 4.6 +/- 1.4 cm                | 10.7 +/- 1.7 cm              | 7.6 +/- 1.5cm                   |

Hurd WW, Bude RO, DeLancey JO, Newman JS. The location of abdominal wall blood vessels in relationship to abdominal landmarks apparent at laparoscopy. *American Journal of Obstetrics & Gynecology*. 171(3):642-6, 1994 Sep.

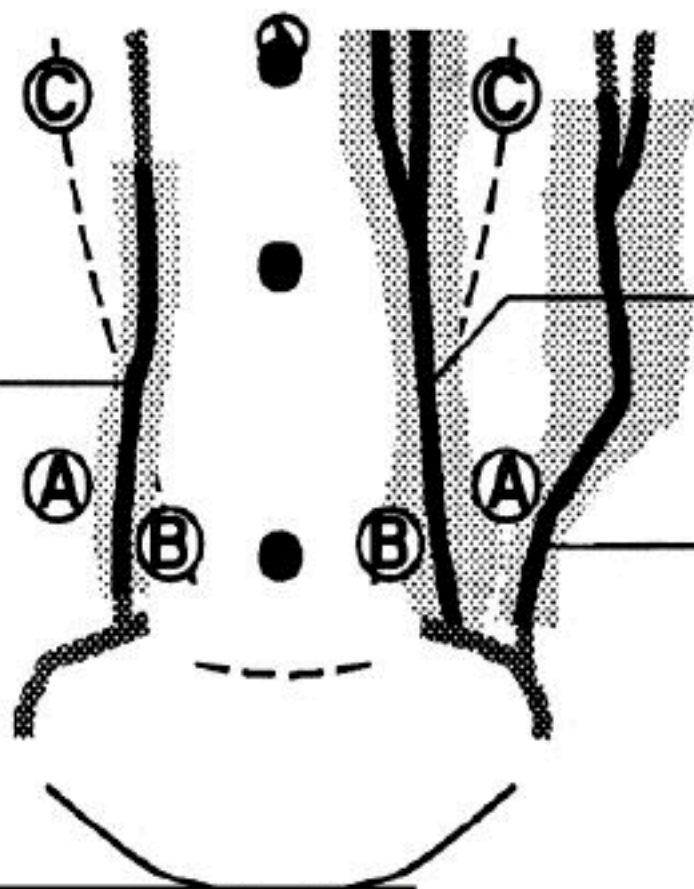
**Deep  
Vessel**

Inferior  
epigastric

**Superficial  
Vessels**

Superficial  
epigastric

Superficial  
circumflex  
iliac

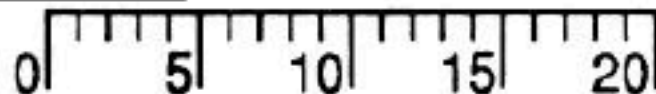


**Ideal Port Placement**

**A: 5 cm above symphysis / 8 cm from midline**

**B: 3 cm above symphysis / 4 cm from midline**

**C: 16 cm above symphysis / 8cm from midline**



# Conclusion

- No single technique or instrument has been proved to eliminate laparoscopic entry associated injury
- Proper evaluation of the patients, supported by surgical skills and good knowledge of the technology and instrumentation is the keystone to safe access and prevention of complications during laparoscopic surgery