

Laparoscopy – Basic Principles

PD Dr. Martin Schenk

Laparoscopy Setup

Monitor

Light Source

Processor for Camera

Gas Supply for Insufflation

Irrigation and Aspiration

HF Surgery System

Documentation System

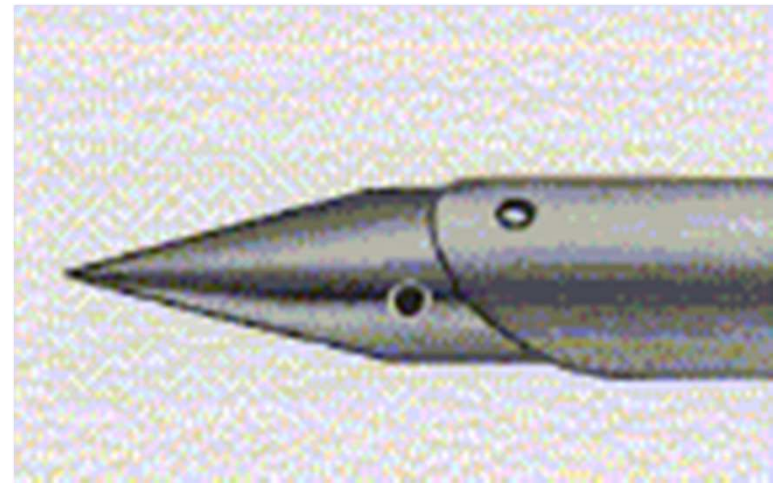


Goal 1: Get First Access



Original Acquisition by Blind Puncture

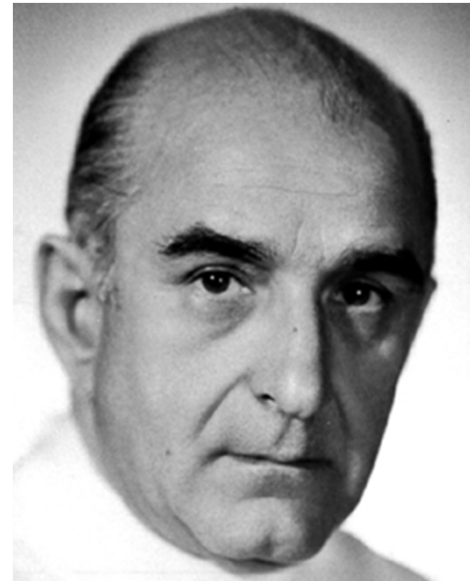
- Danger of Bowel Injury
- Bleeding
- Inexperience of Surgeon
- 40% of Complications



History Excursion

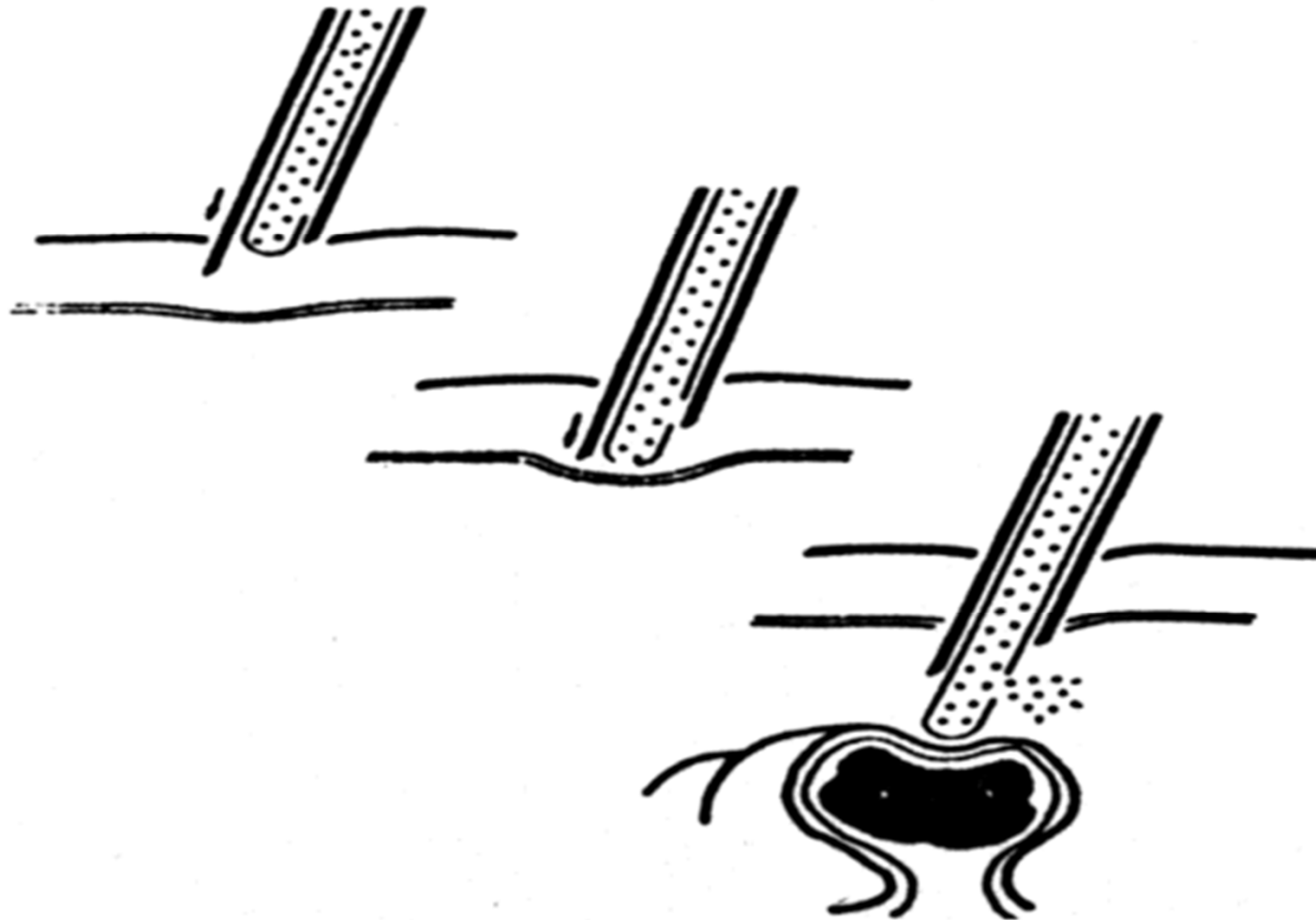
1938

Janos Veress of Hungary developed a specially designed **spring-loaded needle** for draining ascites and evacuating fluid and air from the chest.



Veress needle is the **most important instrument today** to create a pneumoperitoneum.

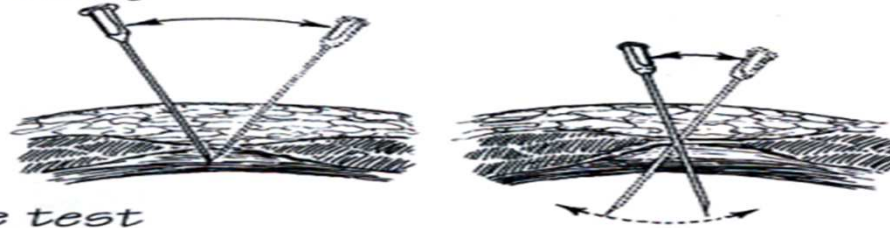
Veress Needle



A Lateral needle swing

*Large arc
indicates
tip is fixed*

*Small arc
indicates
tip is free*



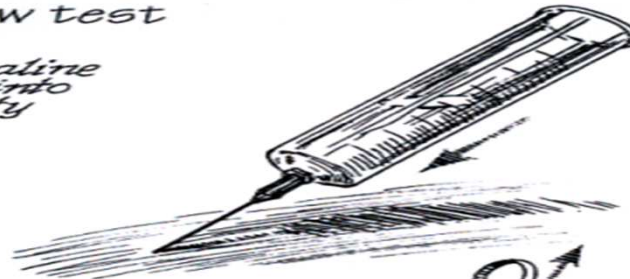
B Epidural space test

*Drop of saline in needle
hub disappears in the
low pressure of the
peritoneal space*



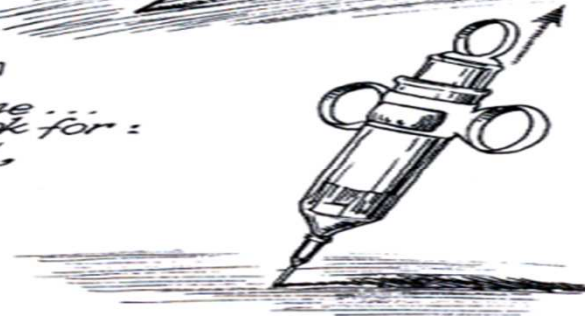
C Syringe barrel flow test

*Easy flow of saline
or anesthetic into
peritoneal cavity*



D Syringe aspiration

*Inject 2cc. saline...
aspirate and look for:
Blood, Bowel,
Bladder, Bile*



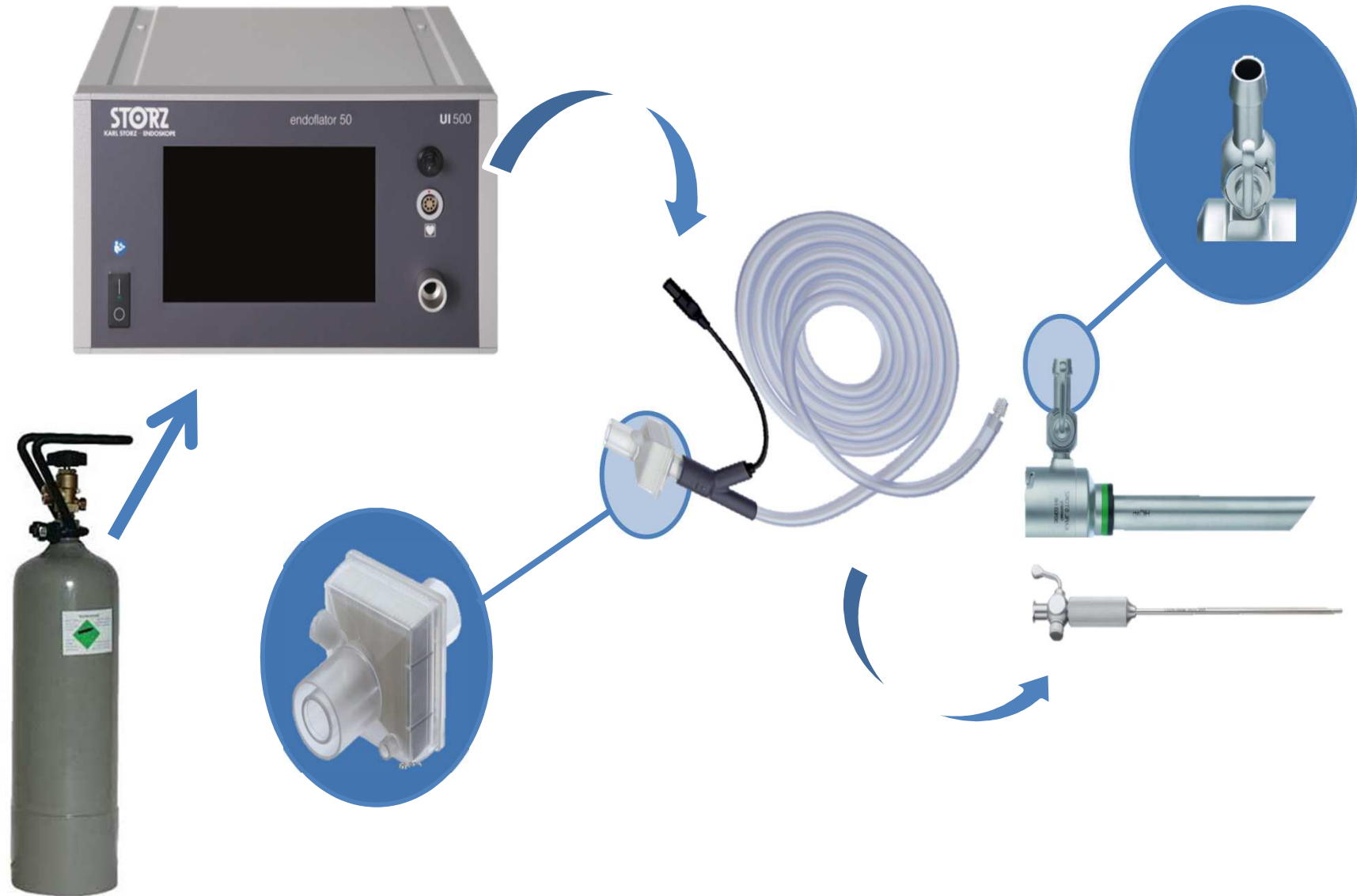
E Free flow of gas

*Consistent low insufflation
pressure, below 15-20mm.Hg*



Goal 2:
Get Space

Insufflation



Insufflator

- CO₂ is used because this has the same refractive index as air, so doesn't distort the image and is non-combustible.
- Intraabdominal pressure run between 10 and 13 mmHg.
- Use disposable filter and tubing for each patient.
- High flow insufflators (35 litres/min) output determined by size of outlet.
- Ensure you know how to change a cylinder and where they are stored.



SUMMARY OF FINDINGS FOR THE MAIN COMPARISON *[Explanation]*

Nitrous oxide versus carbon dioxide for establishing pneumoperitoneum during laparoscopic abdominal surgery						
Patient or population: people undergoing laparoscopic general abdominal or gynaecological pelvic surgery under general anaesthesia Setting: secondary and tertiary care Intervention: nitrous oxide pneumoperitoneum Comparison: carbon dioxide pneumoperitoneum						
Outcomes	Anticipated absolute effects* (95% CI)		Relative effect (95% CI)	No of participants (studies)	Quality of the evidence (GRADE)	Comments
	Risk with carbon dioxide pneumoperitoneum	Risk with nitrous oxide pneumoperitoneum				
Cardiopulmonary complications Follow-up: 0 to 1 month	29 per 1000	57 per 1000 (11 to 302)	RR 2.00 (0.38 to 10.43)	140 (2 studies)	⊕○○○ Very low ^{1,2}	Trial sequential analysis showed a divergence; adjusted required information size of participants to support or refute nitrous oxide pneumoperitoneum
Procedure-related general complications Follow-up: 0 to 1 month	28 per 1000	28 per 1000 (5 to 160)	RR 1.01 (0.18 to 5.71)	143 (2 studies)	⊕○○○ Very low ^{1,2}	Trial sequential analysis showed a divergence; adjusted required information size of participants to support or refute nitrous oxide pneumoperitoneum
Pneumoperitoneum-related serious adverse events Follow-up: 0 to 1 month	See comment	See comment	Not estimable	196 (3 studies)	⊕⊕○○ Low ^{3,4}	None of the studies reported any pneumoperitoneum-related serious adverse events
Mortality Follow-up: 0 to 1 month	See comment	See comment	Not estimable	196 (3 studies)	⊕⊕○○ Low ^{3,4}	None of the studies reported any deaths

Quality of life	None of the studies reported quality of life.					
Pain scores (first post-operative day) VAS, lower score indicates less pain. Scale: 0 cm to 10 cm Follow-up: 1 day	See comment	See comment	Not estimable	140 (2 studies)	⊕○○○ Very low ^{3,4,5}	Neither trials reported the standard deviation for pain scores on VAS scale. Substantial clinical heterogeneity between the 2 studies
Analgesia requirements Follow-up: 1 week	The mean analgesia requirement in the carbon dioxide pneumoperitoneum was 54.4 mg of oxycodone and 2.0 tablets/24 hours of ibuprofen	The mean analgesia requirement in the nitrous oxide pneumoperitoneum was 0.69 standard deviations lower (1.42 lower to 0.04 higher)	SMD -0.69 (-1.42 to 0.04)	193 (3 studies)	⊕○○○ Very low ^{3,4,6}	-
Hospital costs	None of the studies reported costs.					

* The basis for the **assumed risk** is the mean comparison group proportion in the studies. **The risk in the Intervention group** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI).

CI: confidence interval; RR: risk ratio; SMD: standardised mean difference; VAS: visual analogue scale.

GRADE Working Group grades of evidence

High quality: We are very confident that the true effect lies close to that of the estimate of the effect.

Moderate quality: We are moderately confident in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.

Low quality: Our confidence in the effect estimate is limited: The true effect may be substantially different from the estimate of the effect.

Very low quality: We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect

¹ Downgraded two levels for very serious risk of bias.

² Downgraded one level for serious imprecision (the confidence interval of risk ratio overlapped 0.75 and 1.25, and small sample size).

³ Downgraded one level for serious imprecision (small sample size).

⁴ Downgraded one level for serious risk of bias.

⁵ Downgraded one level for indirectness.

Goal 3: Get Visual Access

Light

KARL STORZ

Invention of a source of cold light
in 1960



Light Sources

LED



20161420
Power LED 175



20161201
LED Nova 150



Halogen



20113320
250 twin

Xenon



20131520
NOVA 175

20134020
NOVA 300



20132120-1
175

20133120-1
300



20132601-1
100 SCB

Xenon/FI



20133620-133
D-Light C AF

20133720-1
D-Light P

Telescope

STORZ / HOPKINS 1965

Introduction of HOPKINS®-Telescope

80fold Light intensity

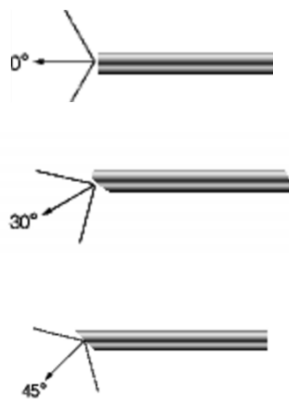


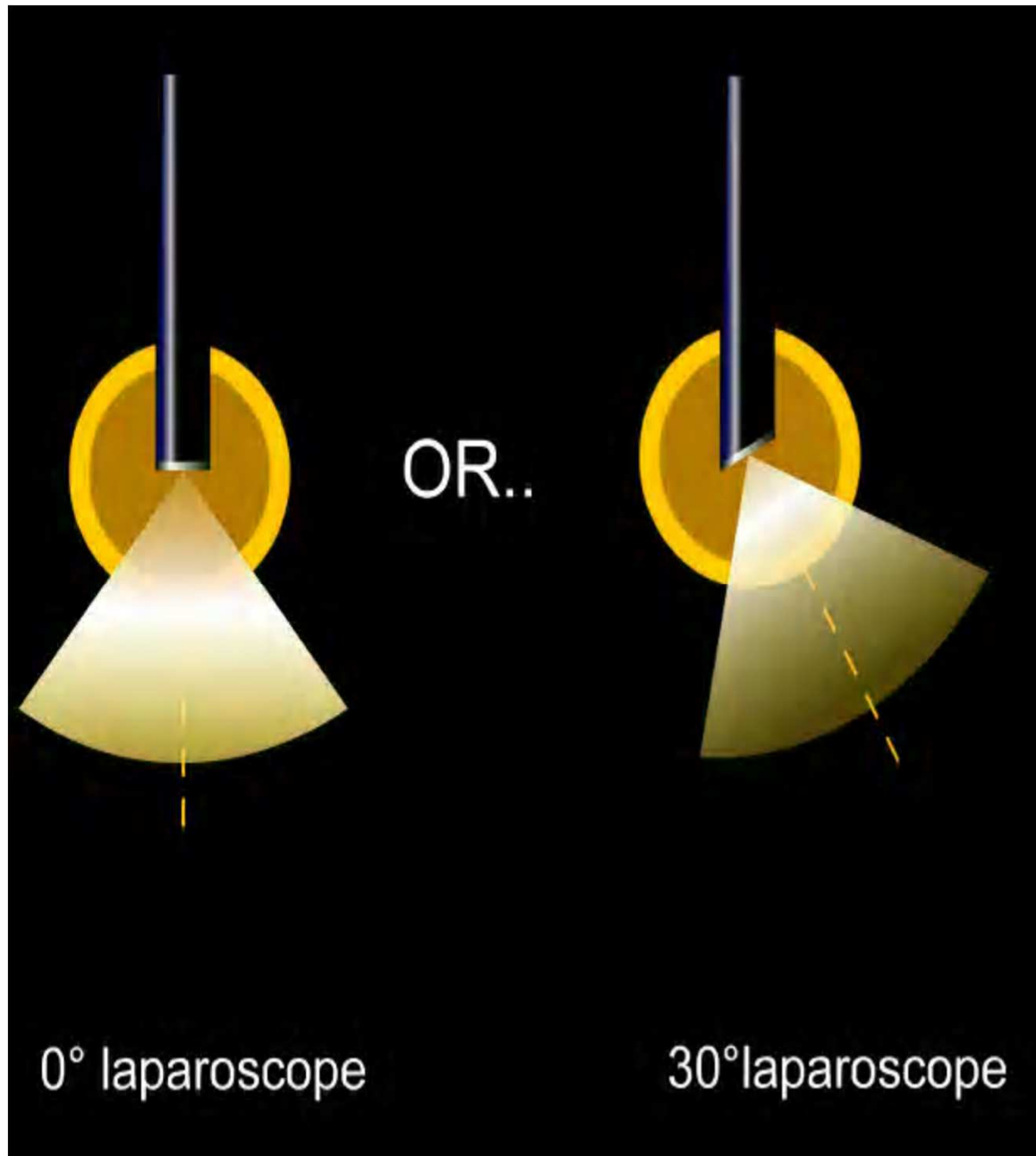
Telescope with normal lens geometry



KARL STORZ Telescopes Ø 2mm – 10mm

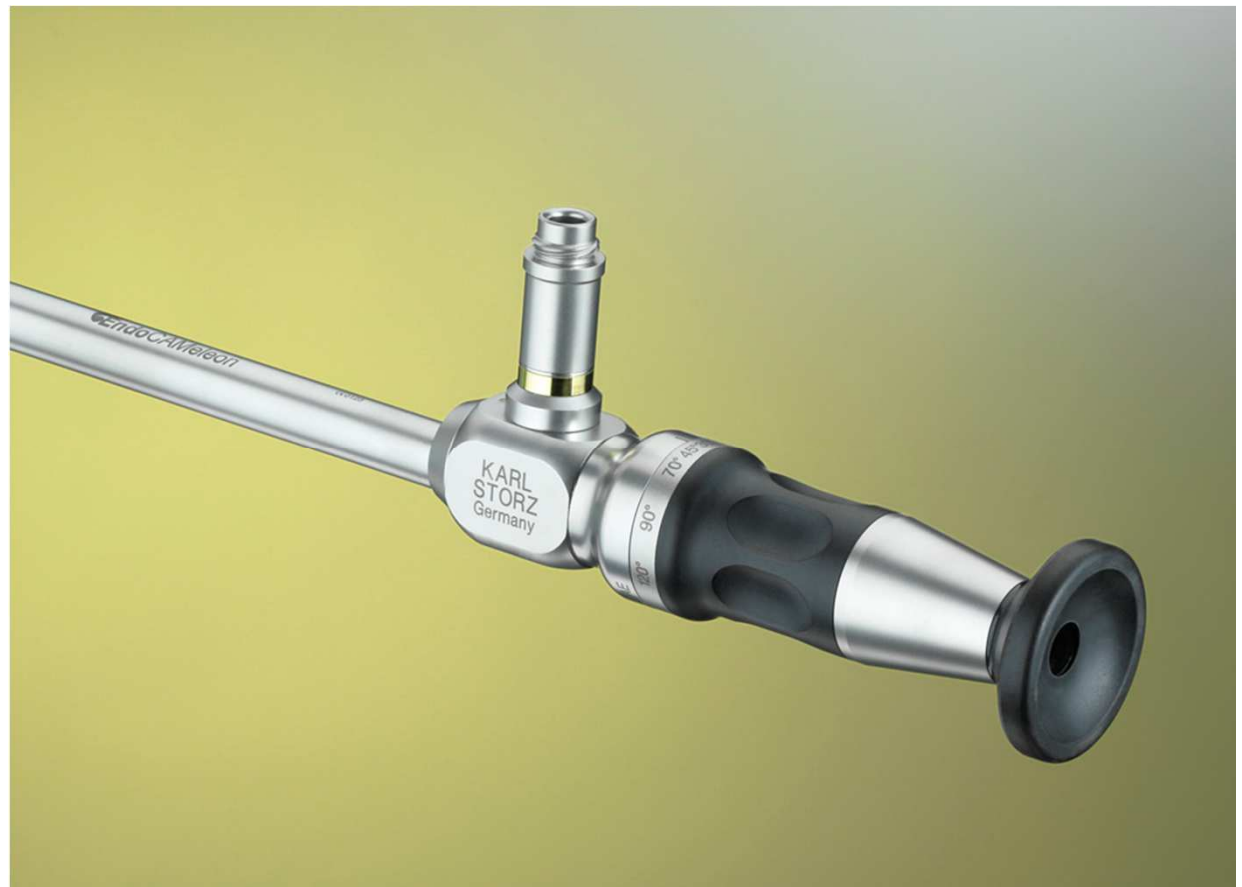
Angle: 0° - 45°



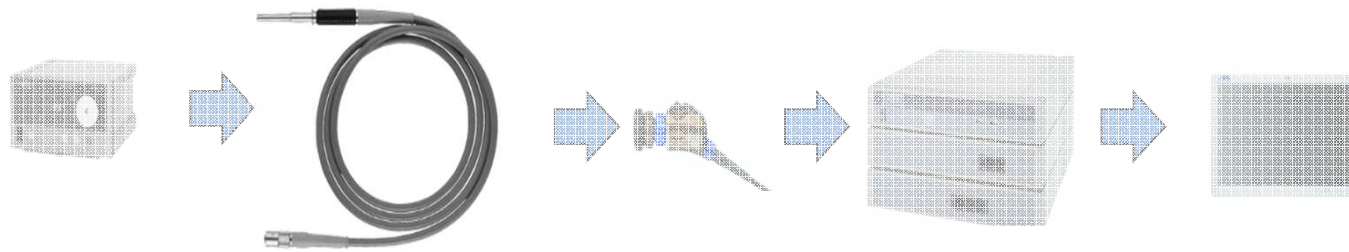




- Variable Angle
0° to 120°
- autoclavable



Components of the optic chain



Fiber Optic Cable – perfect Transmission of Light

- High Transmission of Light
 - Optimized Adapter, specific diameter and length
 - High Quality of Fibers
- Resistance
- Special Applications like Fluorescence



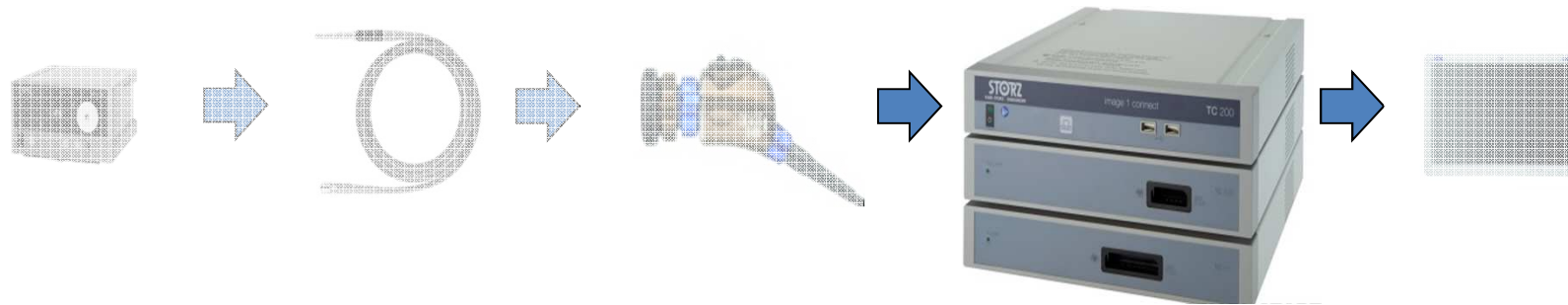
Components of the optic chain



Camera Head – The high Art of FULL HD

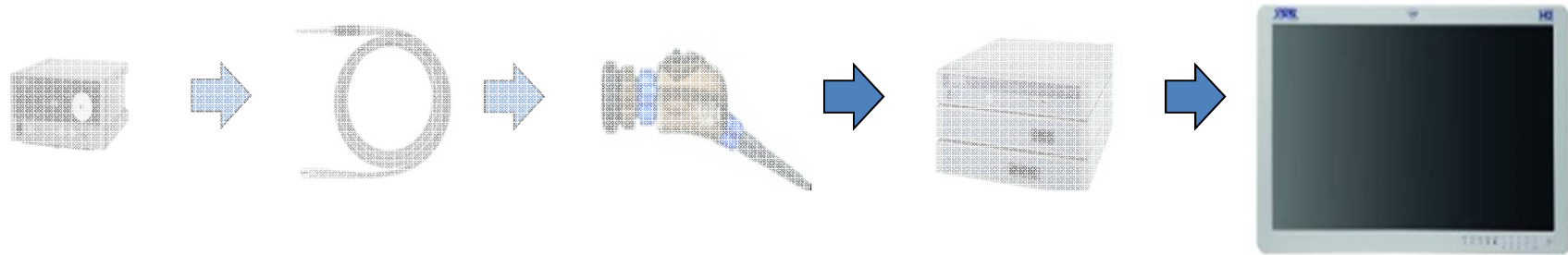
Full HD = 1920x1080, progressive scan, 16:9

Components of the optic chain



Optical Controller – The Heart of Imaging

Components of the optic chain



**Monitor -
High Picture Quality**

The perfect optic chain

Best Quality by concerted Components



Endoskop VOLTcraft BS-30

Conrad Electronic SE (DE)https://www.conrad.de/de/endoskop-voltcraft-bs-30x-hr-sonden-o-8-mm-sonden-laenge-88-cm-bildrotation-fokussierung-led-beleuchtung-wechselbare-1086336Suchen

MeistbesuchtErste SchritteGroupwiseErbecloudPubMedInCites™Tierschutz

Alle Kategorien

Anmelden
Mein Konto

Produkt-
vergleich

Mein
Merkzettel

Einkaufs-
wagen

Sie sind hier: Start > Messtechnik & Netzgeräte > Messgeräte > Test-, Prüfgeräte > Endoskop-Kameras

Endoskop VOLTcraft BS-30XHR Sonden-Ø: 8 mm Sonden-Länge: 88 cm Bildrotation, Fokussierung, LED-Beleuchtung,...

VOLTcraft.★★★★★(22)Artikel bewerten2 Fragen | 2 Antworten

Bestell-Nr.: 1086336 - 62 Teile-Nr.: BS-30XHR | EAN: 4016138870053



3 Jahre Herstellergarantie

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Online-Bestellung

In der Filiale verfügbar?

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inkl. MwSt., versandkostenfrei

Online verfügbar
Lieferung: 24.10 bis 25.10.2017
oder garantiert am nächsten Werktag bei Auswahl der 24h-Express-Lieferung (zzgl. 8,95 Euro) innerhalb 2 Stunden 26 Minuten

In der Filiale verfügbar?
[Filialverfügbarkeit prüfen](#) und im Einzugsgebiet auch innerhalb von 2 Stunden liefern lassen.

1 Stück

In den Einkaufswagen

- ✓ Wechselbare Kamersonde
- ✓ Wasserdichte Mini-Kamera mit dimmbarer LED-Beleuchtung
- ✓ Ergonomischer Griff
- ✓ 6,8 cm großer Monitor
- ✓ Zoom-Funktion

273D Visualization

Klicken Sie, um Notizen hinzuzufügen

Folie 25 von 78 | "Larissa" | Deutsch (Deutschland)

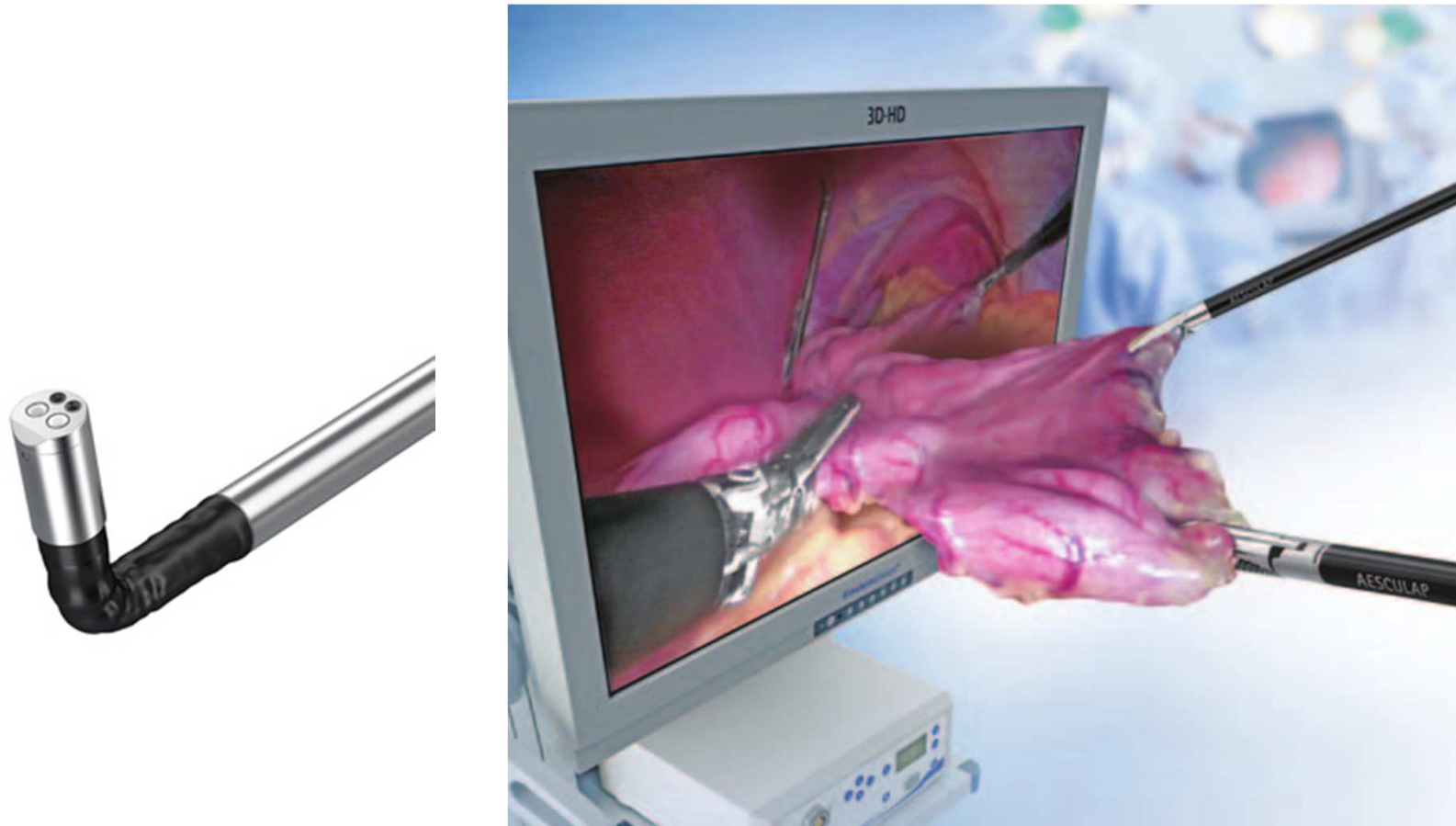
100 %15:0423.10.2017

Operating Theater



Integrated ORs of
KARL STORZ

3D Visualization



Goal 4:
Get Working
Access

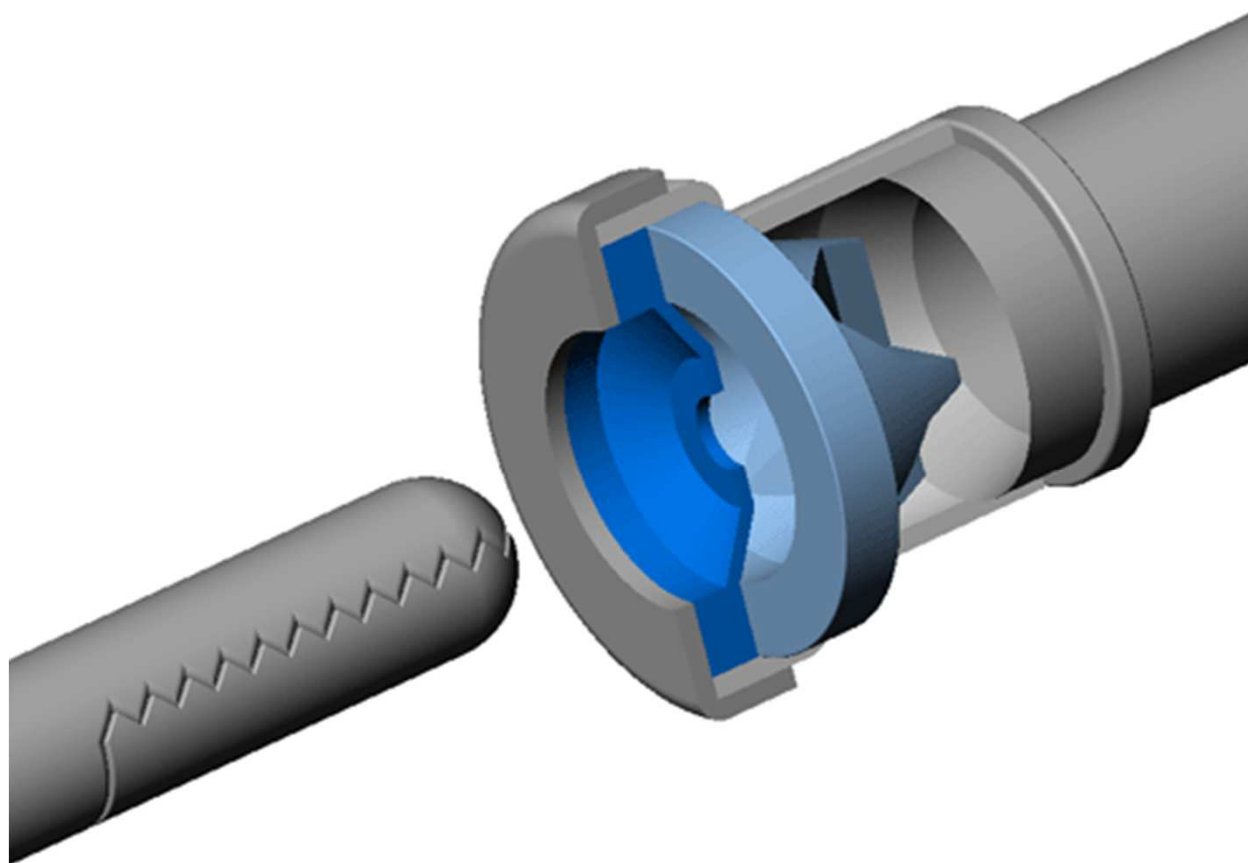
Trocars for Adipositas Surgery
Ø 5mm – 13,5mm



Standard Laparoscopy Trocars
Ø 5mm- 10mm



Trocars for Pediatric Use Ø 2,5 – 3,5mm





Correct trocar placement should provide direct access to the target organs, an optimal view of the operative field and minimize mental and muscular fatigue.

Avoid competing for the same space:

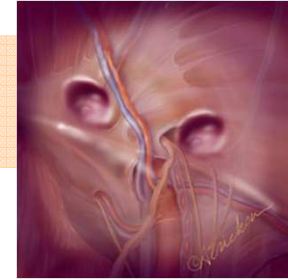
“Dueling swords” phenomenon
(scissoring effect)



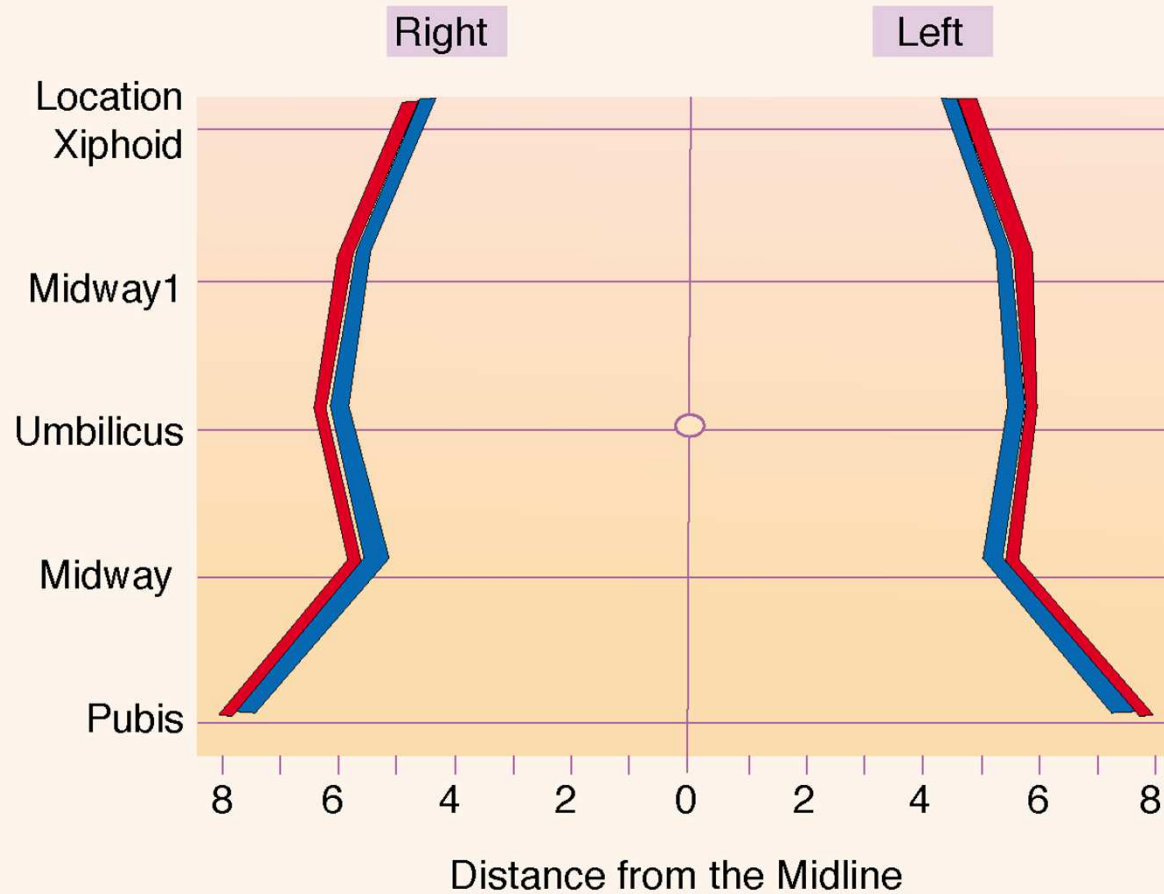
Working against the camera and
'blind spots'



Avoid the epigastric vessels



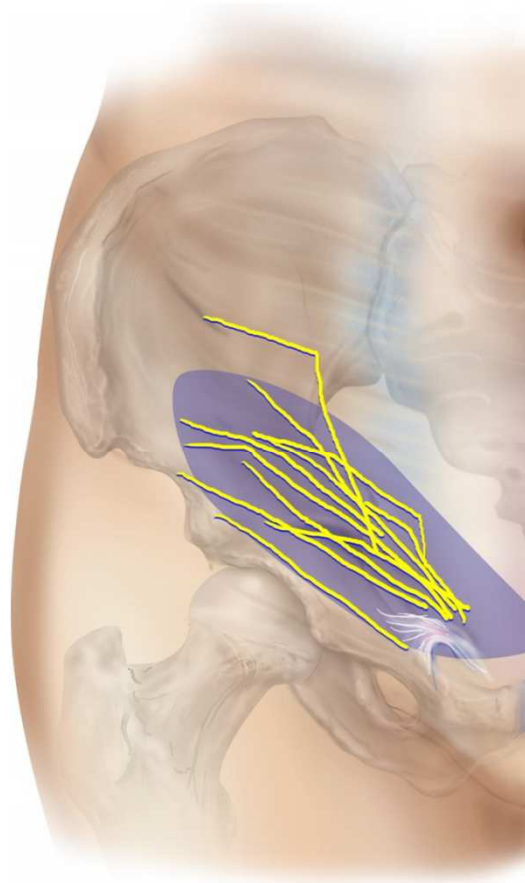
Mapping of epigastric vessels from the midline



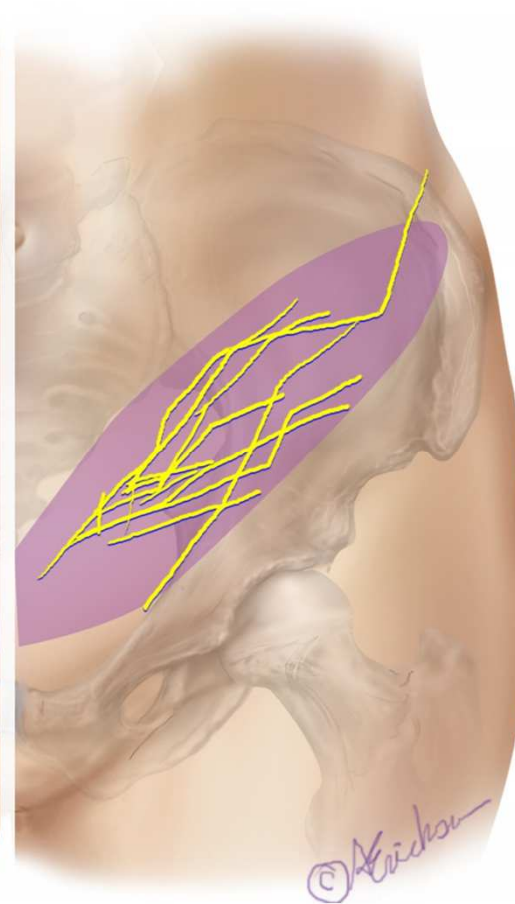
Saber et al. Safety zones for anterior abdominal wall entry during laparoscopy. *Ann Surg* 2004; 239:182

Anatomic distribution of nerves across anterior abdominal wall

Ilioinguinal nerve

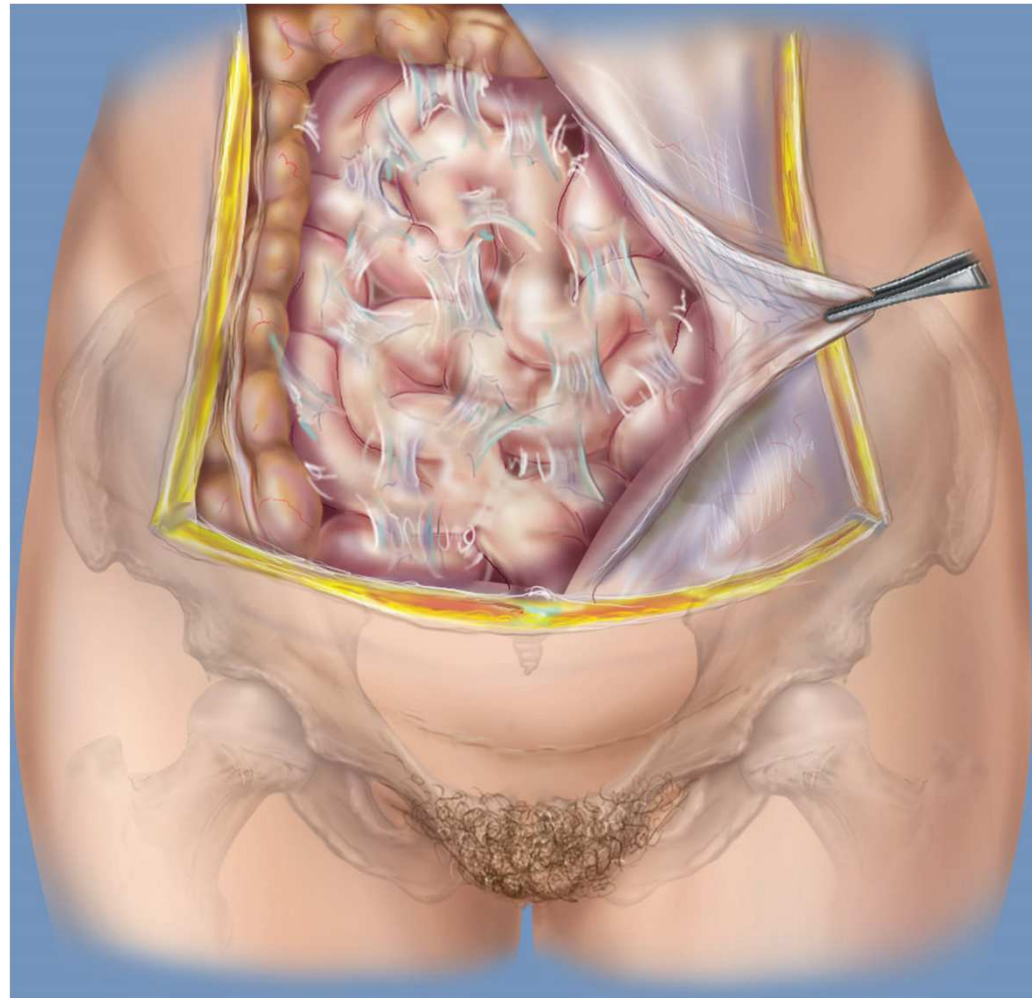


Iliohypogastric nerve



(adapted from) **Anatomy of ilioinguinal and iliohypogastric nerves in relation to trocar placement and low transverse incisions** James L. Whiteside, MD, Matthew D. Barber, MD, MHS, Mark D. Walters, MD, and Tommaso Falcone, MD (Am J Obstet Gynecol 2003;189:1574-8.)

Avoid areas of prior surgery



Trocar

tro-car -

[Fr., *troisis*, three +

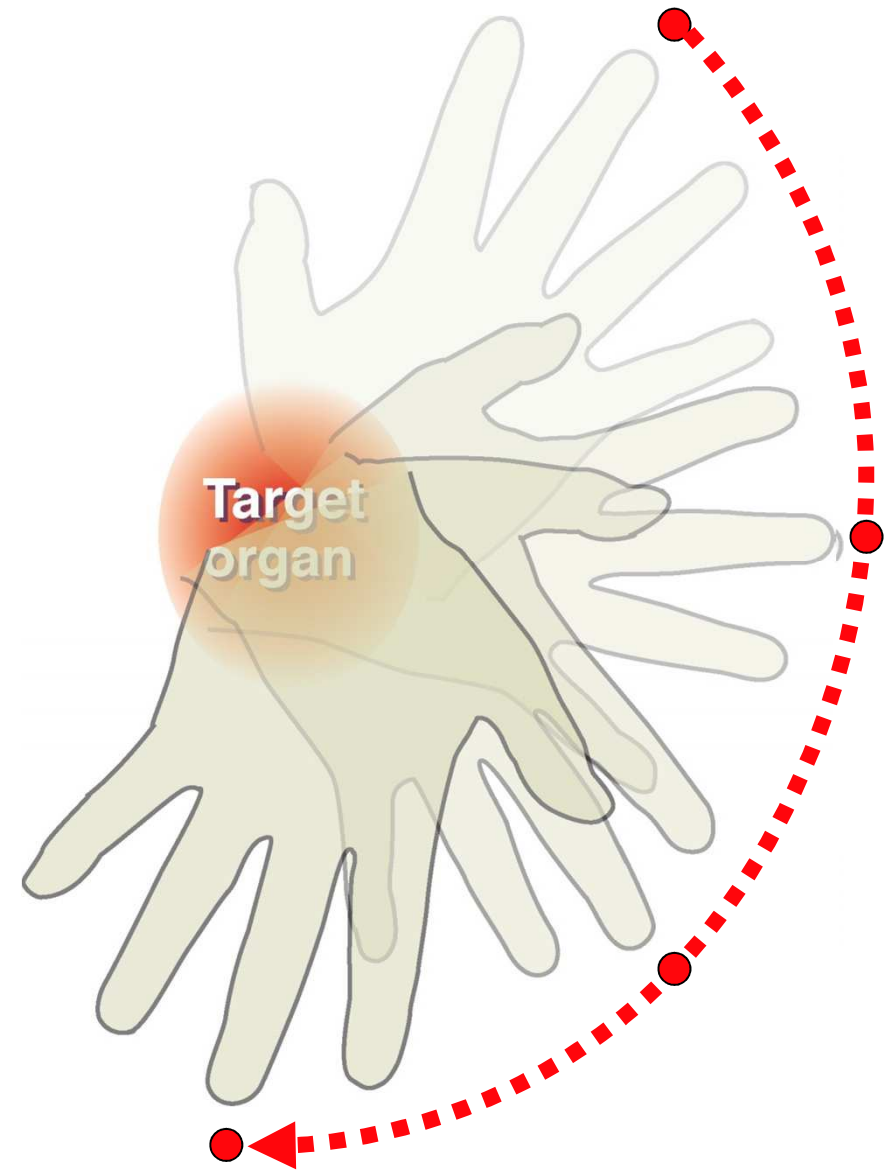
carre, side] *noun*

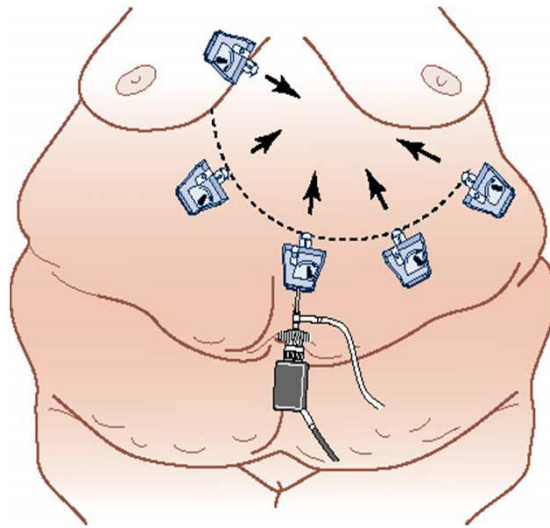
a sharp-pointed surgical instrument fitted with a cannula and used especially to insert the cannula into a body cavity

cannula -

[L., dim of *canna*, reed] *noun*

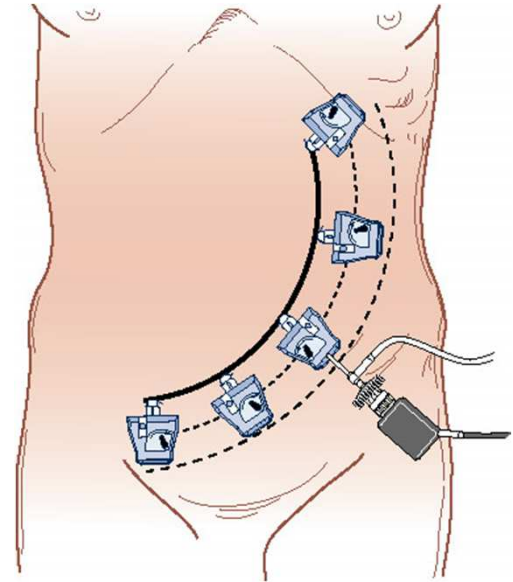
a tube that is inserted into a cavity by means of a trocar filling it's lumen



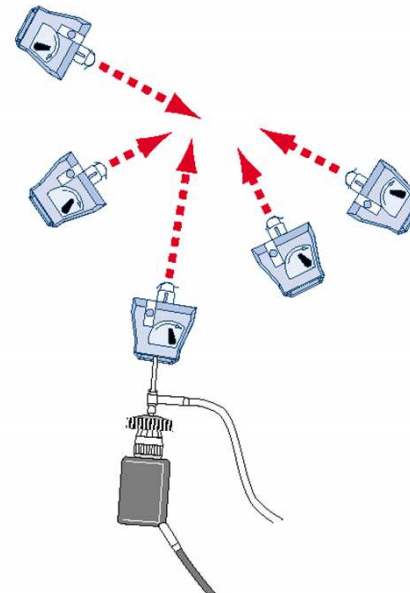


Trocar distance from the target organ depends upon the size of the patient.

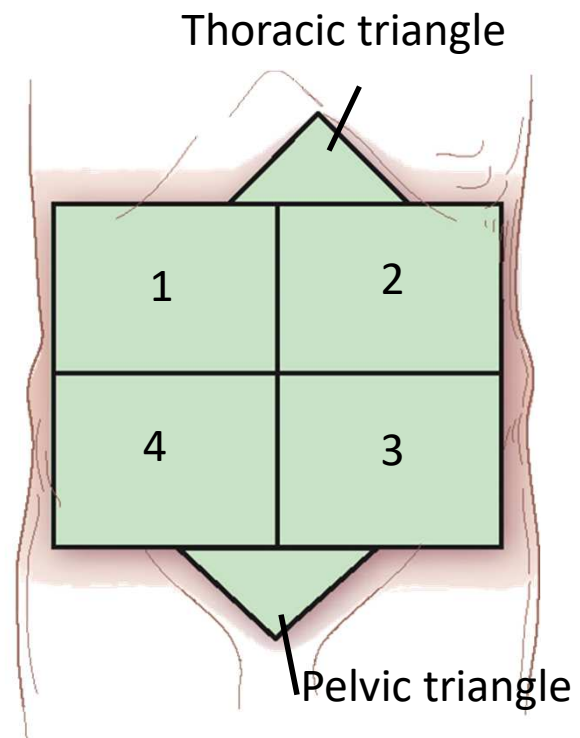
Additional trocars can be added along the semicircular line.



Individual trocars can be moved closer to the target along an axis line.

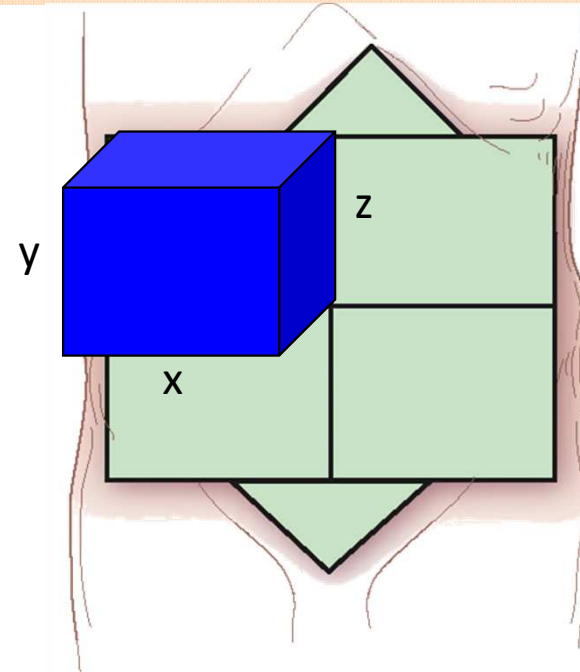
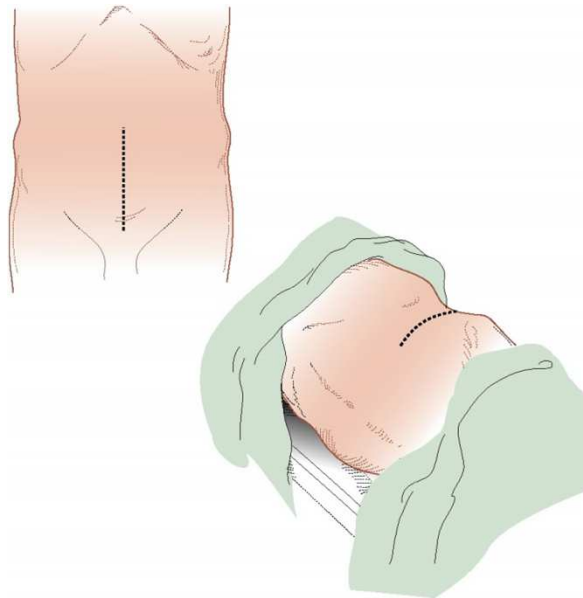


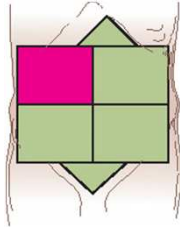
TROCAR PLACEMENT BY QUADRANT



TROCAR PLACEMENT BY QUADRANT

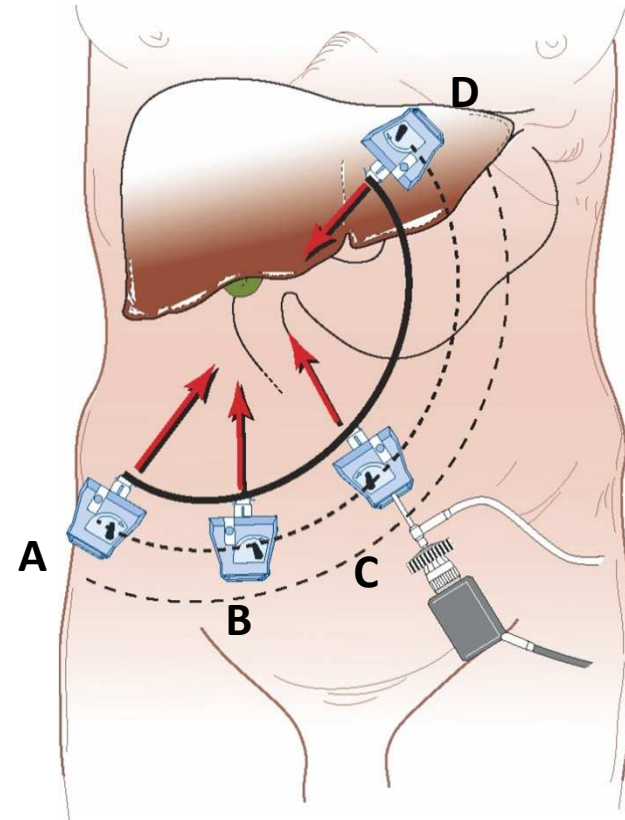
Each quadrant must be addressed from frontal as well as lateral positions.





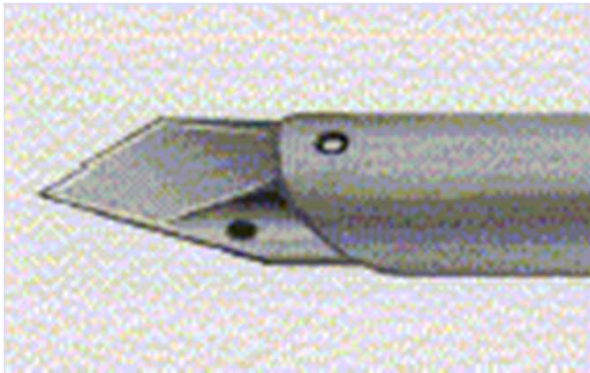
RIGHT UPPER QUADRANT

- Cholecystectomy
- Right liver wedge resection
- CBD exploration
- Choledochoduodenostomy
- Choledojejunostomy
- Pancreatic head resection
- Right colon hepatic flexure resection

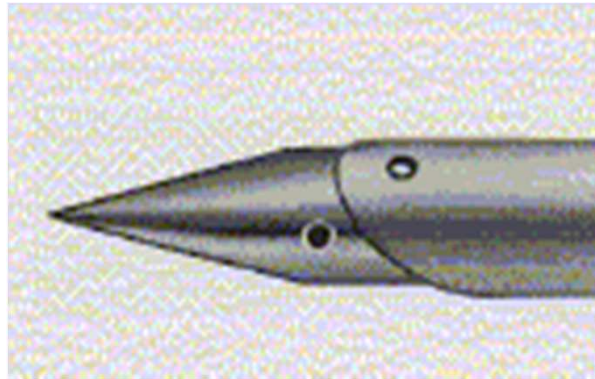


Trocar tips

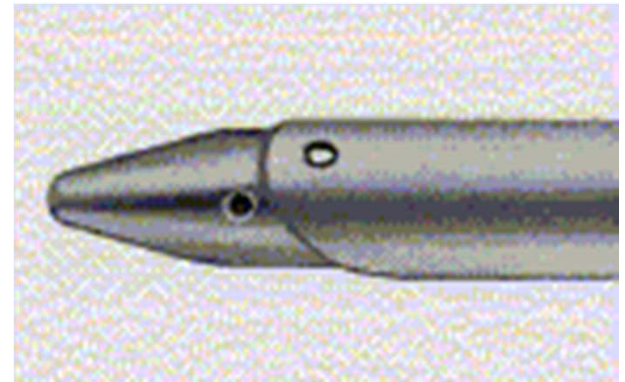
Cutting



Conic

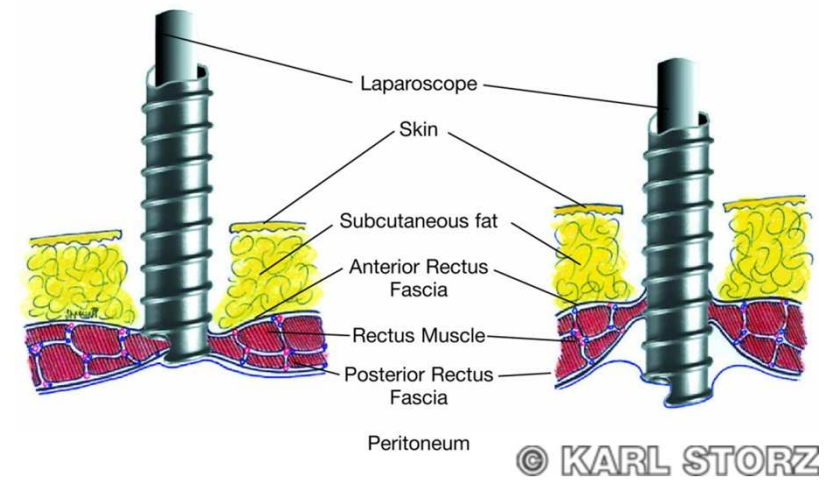


Blunt





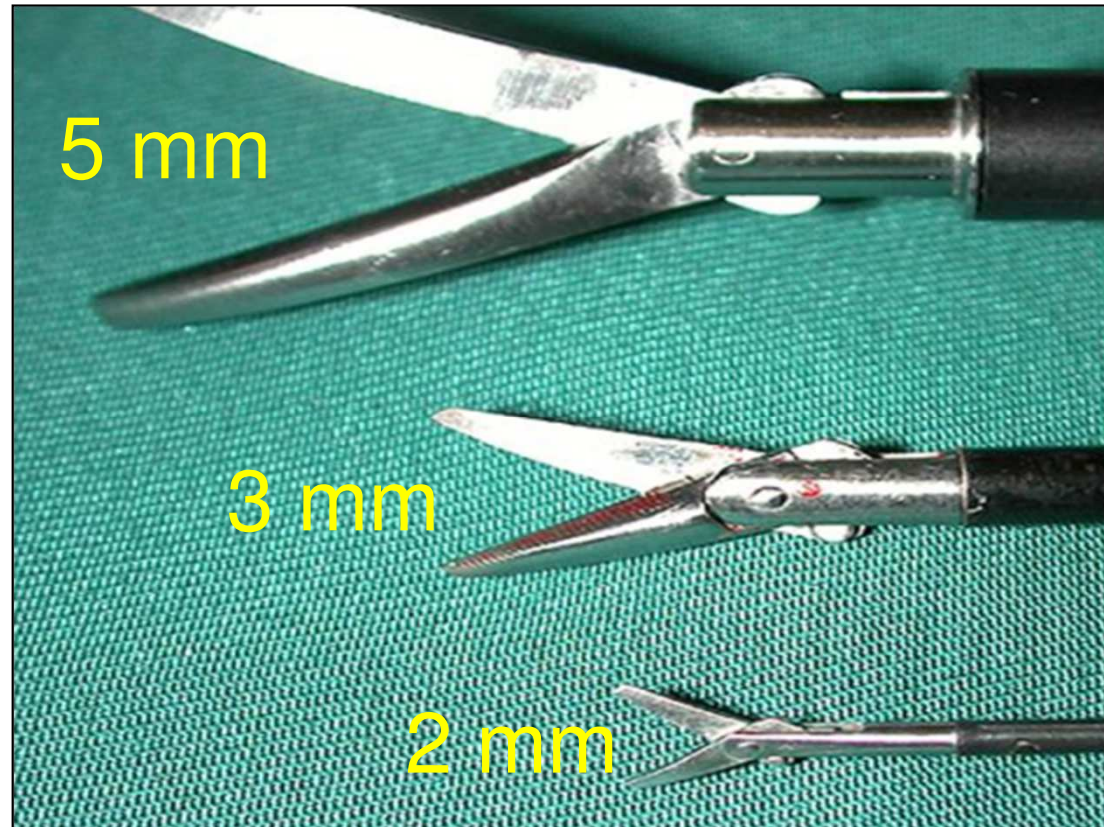
EndoTip[®]



Goal 5:
Do Surgery

Diameters offered by KARL STORZ:

- Ø 2 mm
- Ø 3 mm
- Ø 3.5 mm
- Ø 5 mm
- Ø 10 mm



The

CLICKline™ Concept



Handpieces:

- Very comfortable in long-term use
- Increased Contact Surface in the Ring
- No pressure marks
- 26 different Specifications

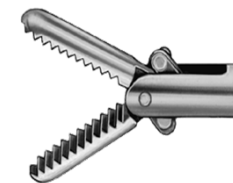
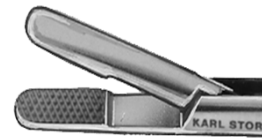
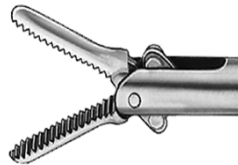
Scissors

- HOOK SCISSORS, single action jaws
- METZENBAUM SCISSORS, curved, length of blades 12-17 mm, widely used as an instrument for mechanical dissection in laparoscopic surgery.
- STRAIGHT SCISSOR can give controlled depth of cutting because it has only one moving jaw.



The Grasping Forceps

- One mobile Jaw Part
- Two mobile Jaw Parts



Needle Holder



Self Riding Jaw



Curved Jaw TC



Straight Jaw TC

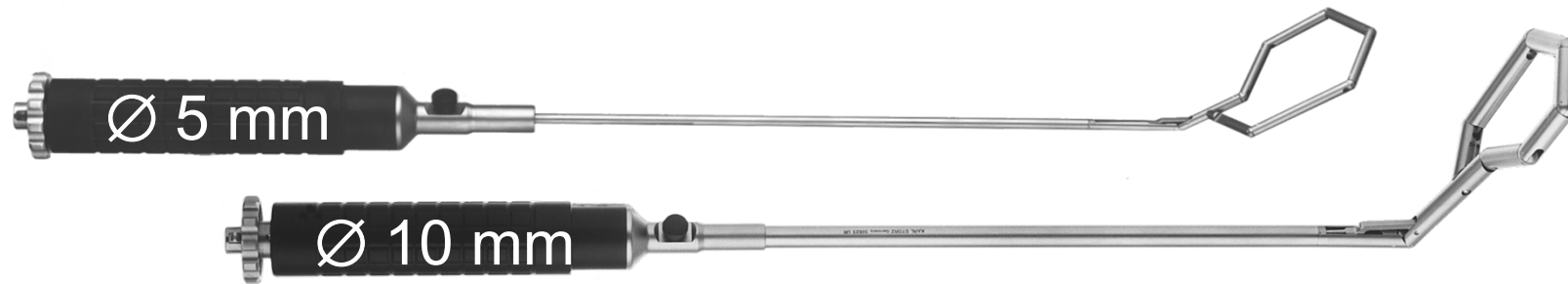


Parrot Jaw TC



1/2 Tooth Jaw TC

Liver Retractor



- Atraumatic and demountable

History Excursion

1977

Kurt Semm, a German gynaecologist, demonstrated the first time the **endoloop suturing technique** in laparoscopic surgery to achieve hemostasis.

1980

Kurt Semm performed the first **laparoscopic appendectomy**.



History Excursion

At that time laparoscopic technique itself was regarded as very dangerous.

During a presentation about laparoscopic resection of ovarian cysts, somebody removed the projector plug and declared Kurt Semm to act unethical.

In 1970 colleges suggested Kurt Semm to undergo a brain examination, because only somebody with a brain damage would undertake a laparoscopic procedure.

1981, after a presentation of Kurt Semms laparoscopic appendectomy, the president of the German Surgical Society suggested to suspend Kurt Semm from the German Gynecologic Society.

History Excursion

1985

The first **laparoscopic cholecystectomy** was performed by **Erich Mühe** in Germany in 1985.

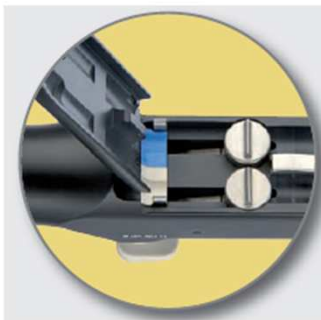
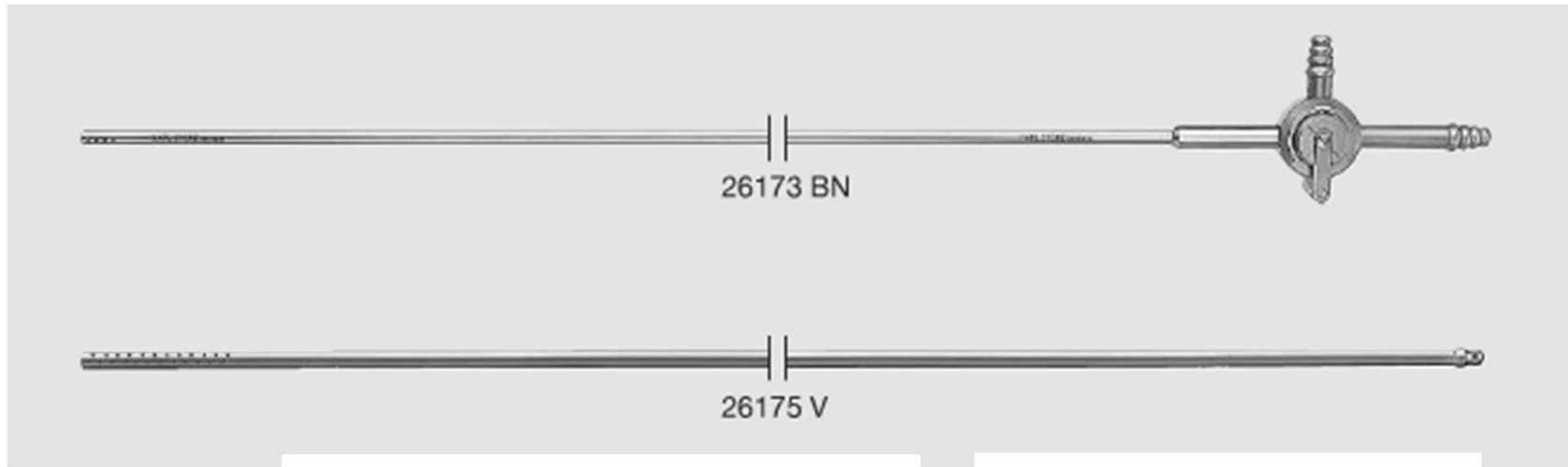


The German Surgical Society **rejected** Mühe in 1986 after his report about his first laparoscopic cholecystectomy, but in 1992 he received their **highest award**.

In 1999 the Society of American Gastrointestinal Surgeons (SAGES) invited Mühe to present the **Storz Lecture**.

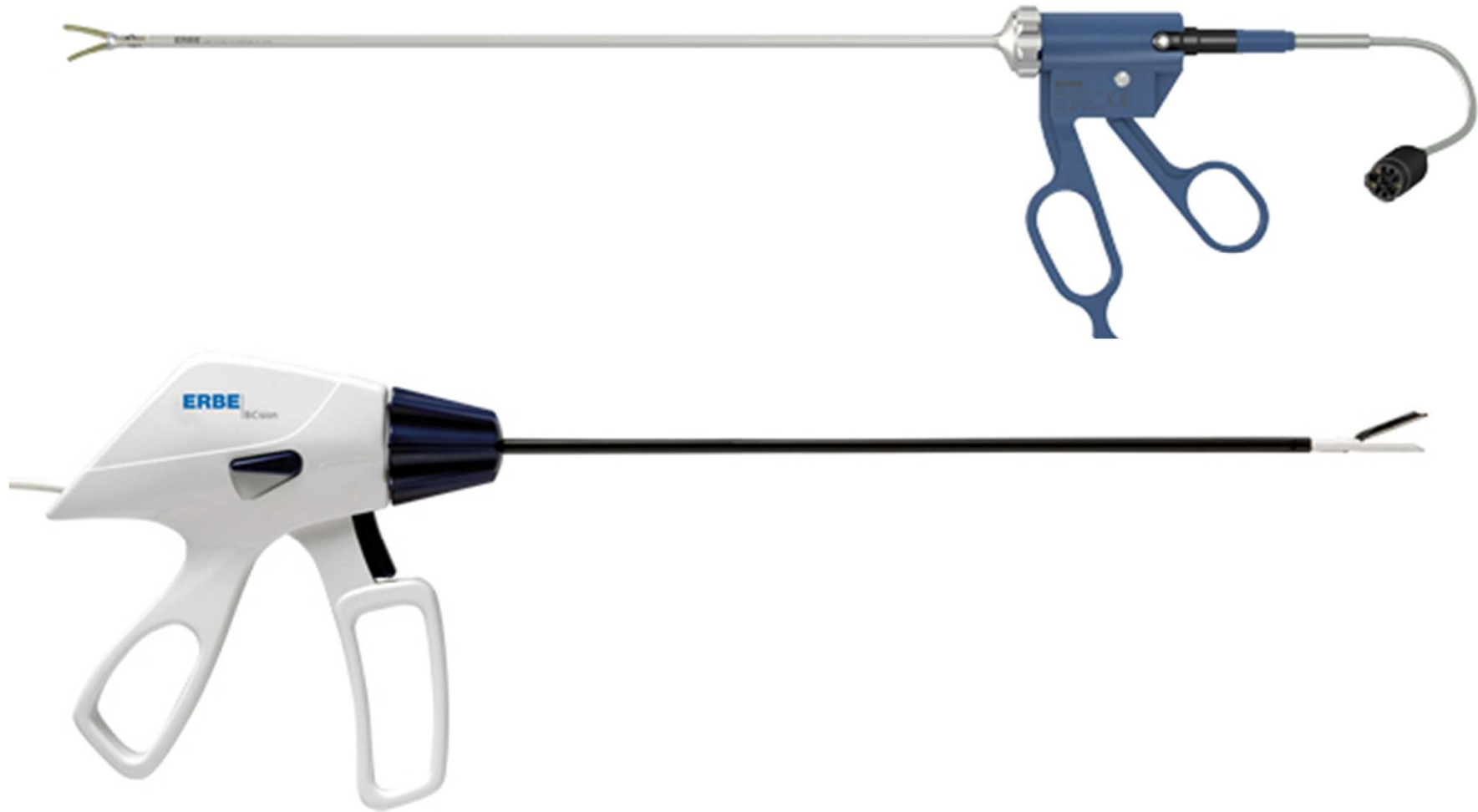
Important Tools

Flushing and Suction



Insertion of the Tubing

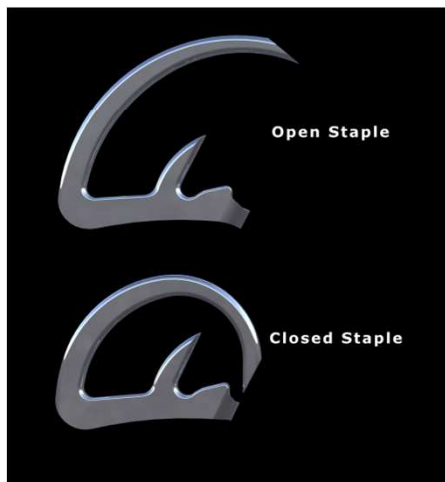
HF Surgery, Energy-based Systems



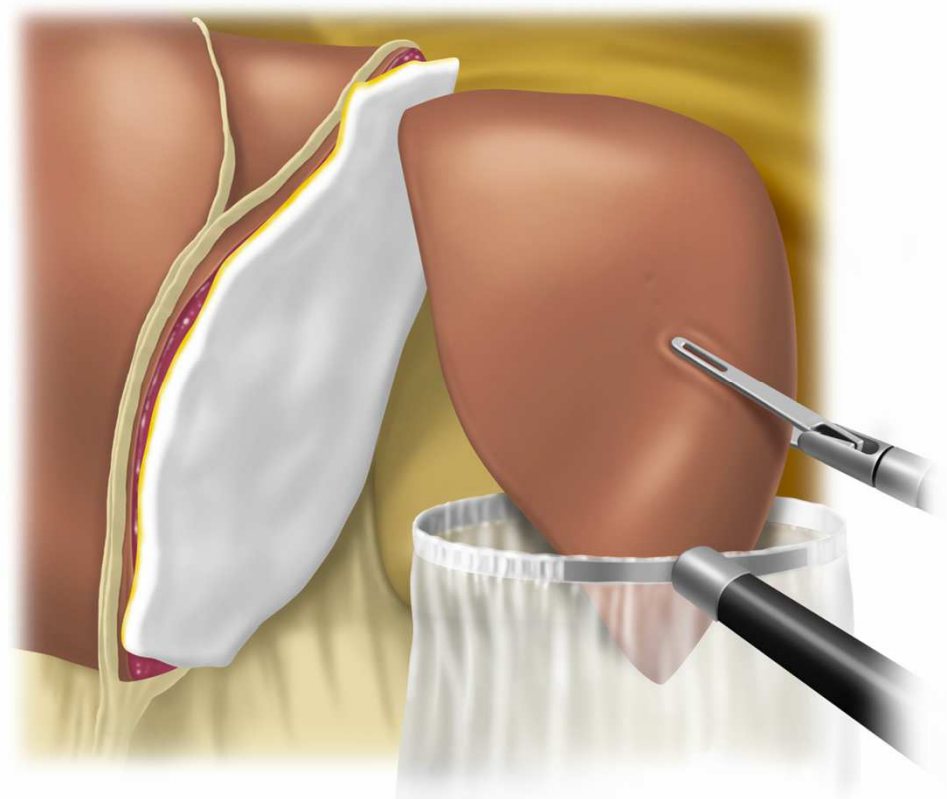
Clip Application



Stapler



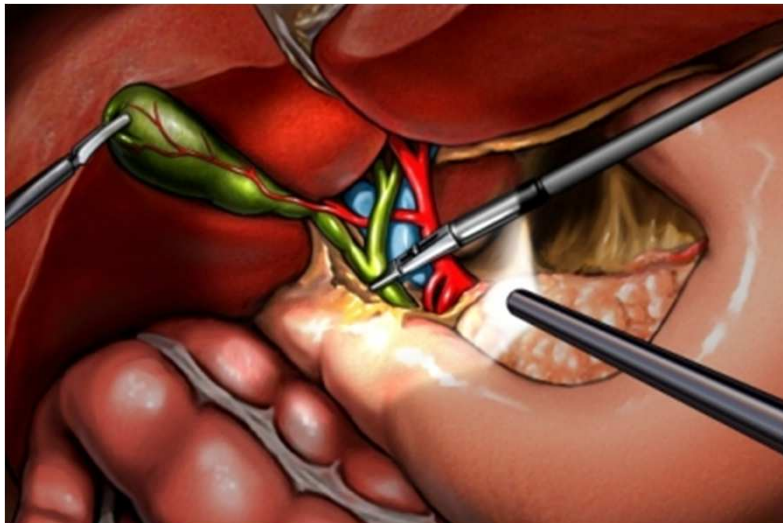
Tissue Retrieval



Conclusions

Laparoscopic/Minimally Invasive Surgery

- First lap cholecystectomy in the US: 1988
- Now, almost every organ is accessible
- >90% of cholecystectomies are done laparoscopically



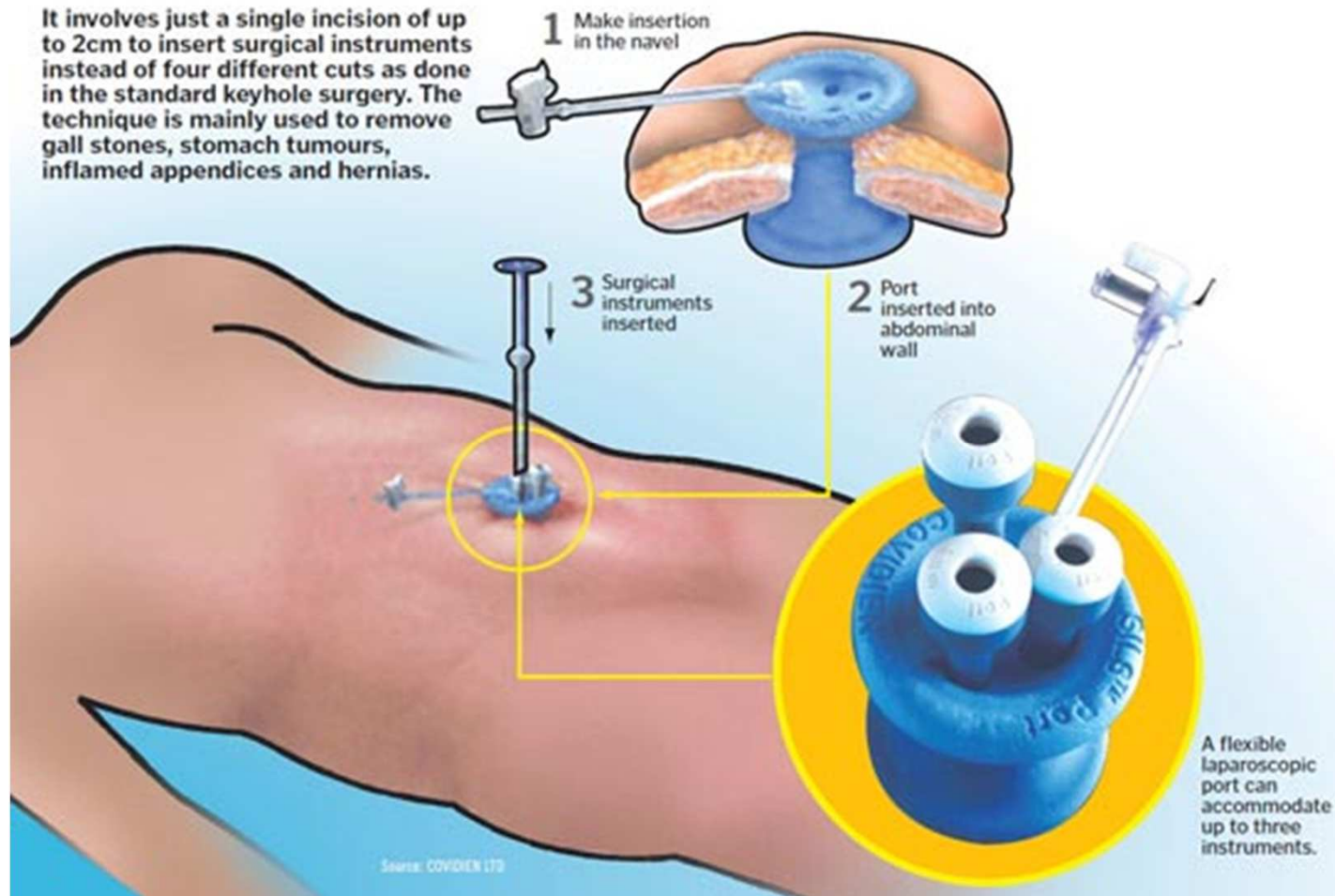
Benefits of Laparoscopic Surgery

- Cosmetic
- Less pain
- Speedier recovery/shorter hospital stay
- Fewer adhesions (scar tissue)
- Fewer wound infections
- Fewer post-operative complications
- Photographs/video/magnified view

Further Developments

Single Port Access Surgery

It involves just a single incision of up to 2cm to insert surgical instruments instead of four different cuts as done in the standard keyhole surgery. The technique is mainly used to remove gall stones, stomach tumours, inflamed appendices and hernias.



Single Port Access Surgery

- Instruments: articulate



Single Port Access Surgery

- Advantages
 - Cosmetic: one incision! Basically scarless
 - Less pain
 - Quicker recovery
- Disadvantages
 - Takes longer
 - Higher cost
 - Restricted degree of movement (tough on surgeon)

Robotic Surgery



The Evolution of Robotic Surgery

- World's first surgical robot, 1983
- 1st robotic cholecystectomy using PUMA, 1987
- da Vinci Surgical Robot clears FDA, 1999-2000
- 1st robotic-assisted heart bypass in USA, 1999
- Remote robotic chole USA to France, 2001
- Robotic-assisted kidney transplant, 2009
- da Vinci Single-Site Platform FDA-approved, 2011

Robotic Surgery

- Benefits
 - More precise/range of motion
 - 3D vision/magnified
 - Less bleeding
 - More comfortable for surgeon
 - Can be done remotely
- Disadvantages
 - Lack of haptics
 - Cost?
 - Long set-up/procedure time
 - Higher learning curve



EndoWrist Instruments

- Each instrument has its own function and can easily be switched using the quick-release lever on each arm
- The device memorizes the position of the arm before being replaced so the next instrument can be set to the same position
- Surgeon can also choose how much force to be applied- can go from an ounce to several pounds



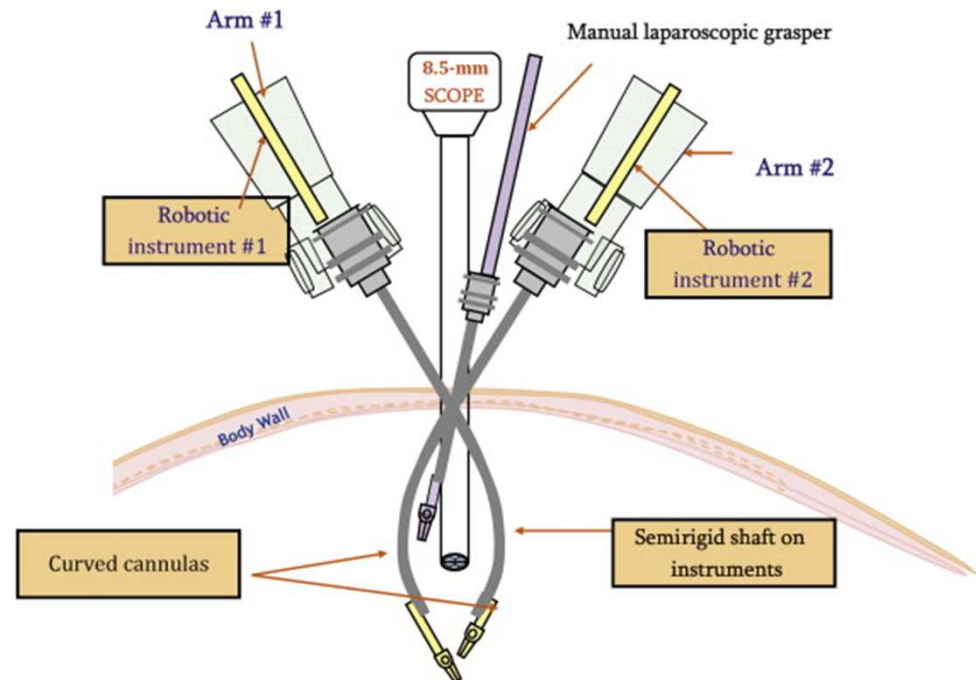
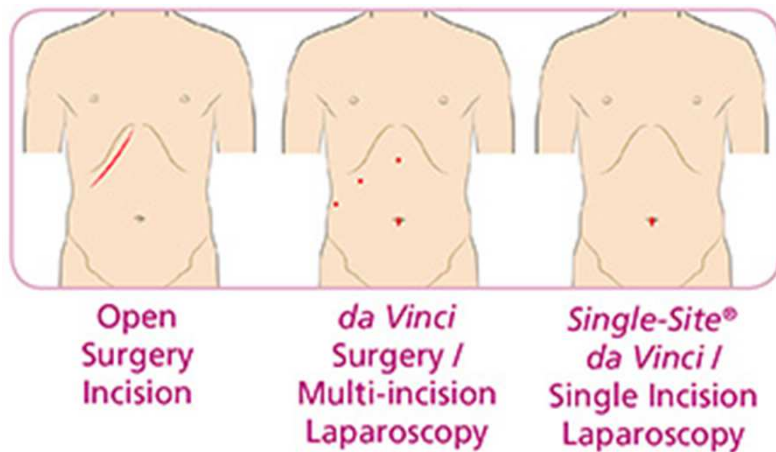
Robotic Surgery

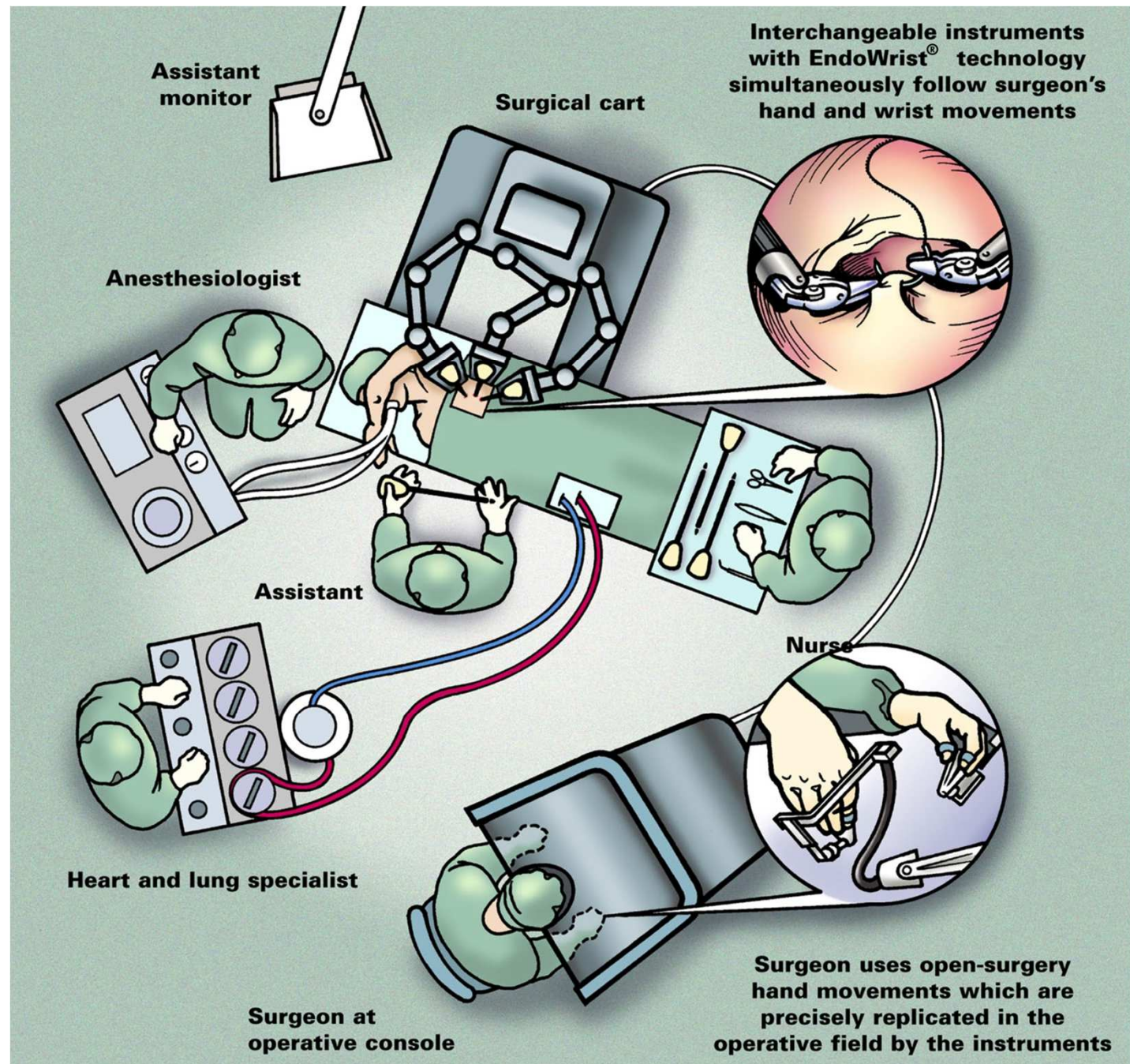
- Commonly used for
 - Urology (prostatectomy)
 - Cardiac (heart surgery)
 - Gynecology (hysterectomy)



Single-Site Robotic Surgery

Added benefits: virtually scarless & high patient satisfaction



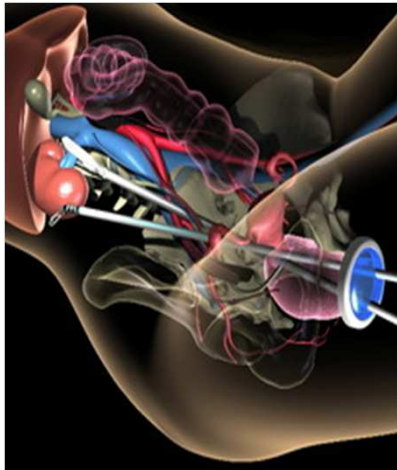
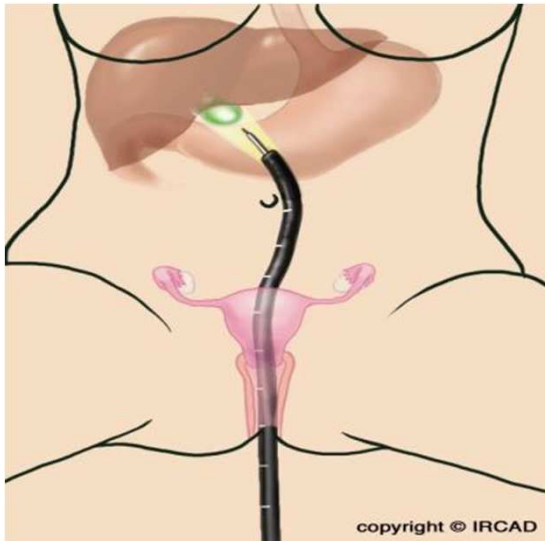


NOTES Surgery

Natural Orifice Transluminal Endoscopic Surgery

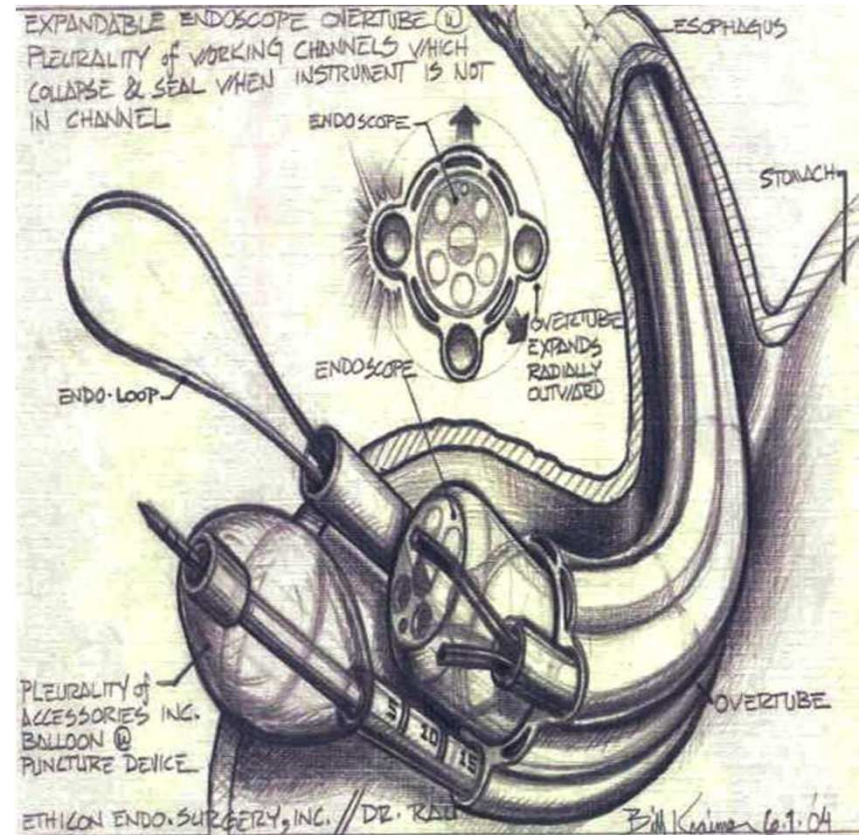
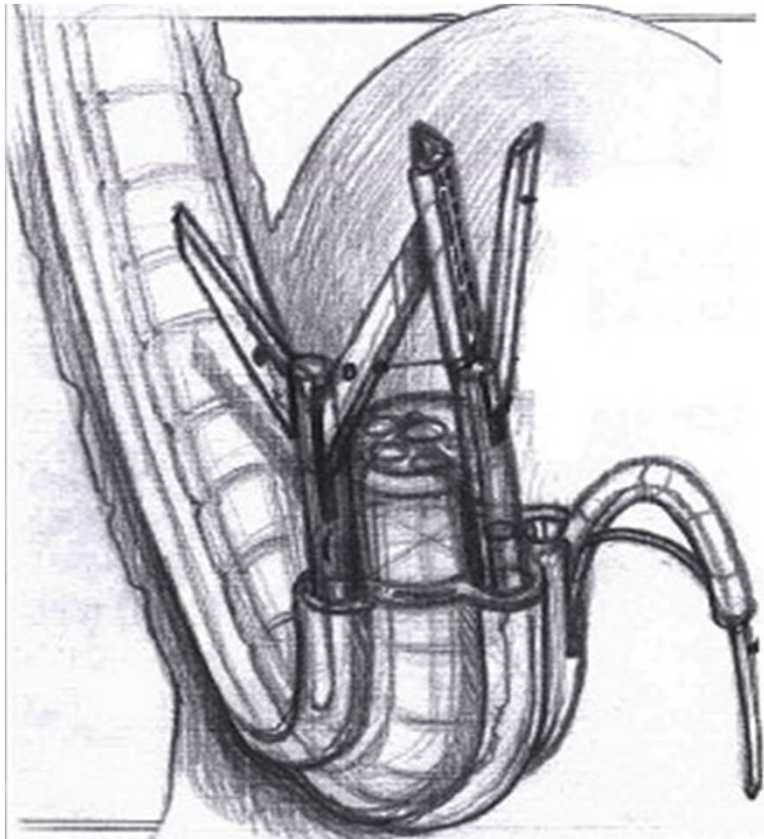
- University centers
- Orifice can be
 - Mouth (to stomach)
 - Vagina
 - Rectum

Notes- Transvaginal



Video-endoscope entering through the posterior vaginal fornix

Notes- Transgastric



Courtesy of N Reddy, Hyderabad India 2005

NOTES Surgery

- Benefits
 - Cosmetic (No scars! Really no scars!)
 - Less pain
 - Faster recovery
 - Less risk of wound infections and hernias
- Disadvantages
 - Learning curve
 - Longer procedure time
 - Problems with closing enterotomies
 - Sterility ?

The End

Based on

- Presentation by PD Dr. Marty Zdichavsky
- Presentation by Karl Storz GmbH