

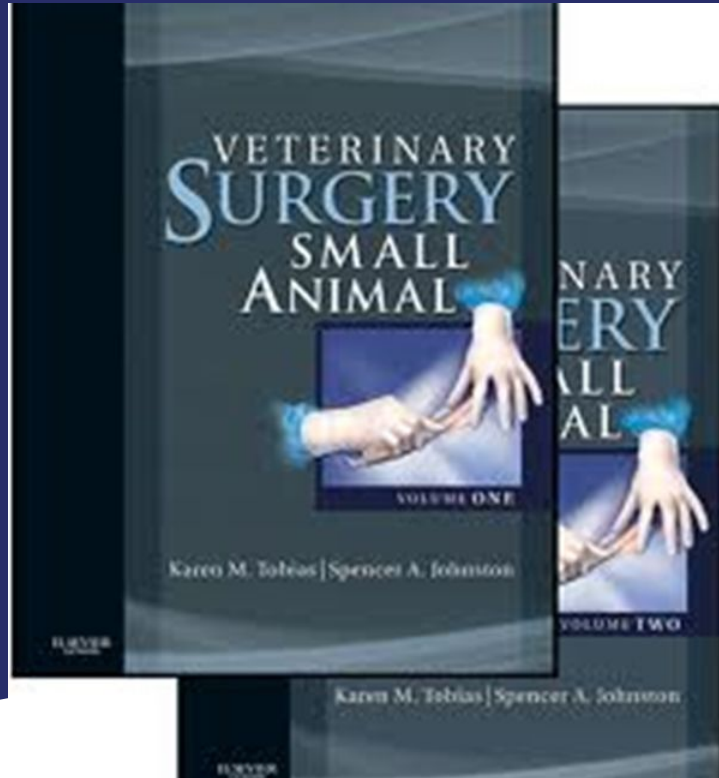
Through the Looking Glass - A Minimally Invasive Approach to Common Surgical Procedures

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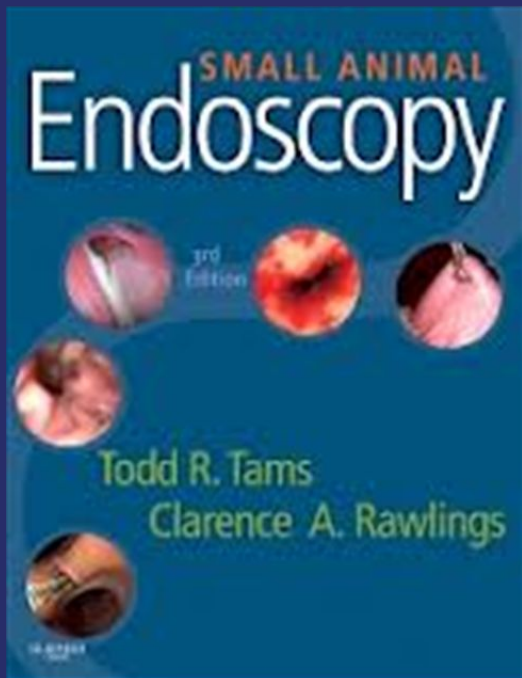
References

Tobias and Johnston

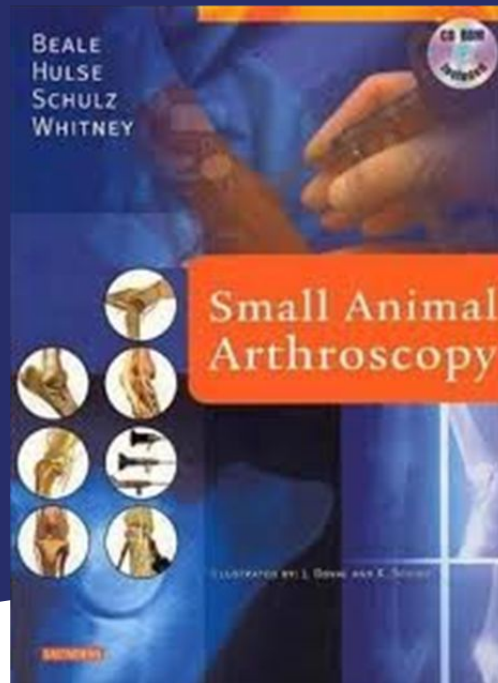


References

Rawlings and Tams



Beale, Hulse, Schulz, Whitney



Introduction

- What is MIS?
- Historic perspective
- Why MIS?
- Equipment Available
- MIS procedures

What is MIS?

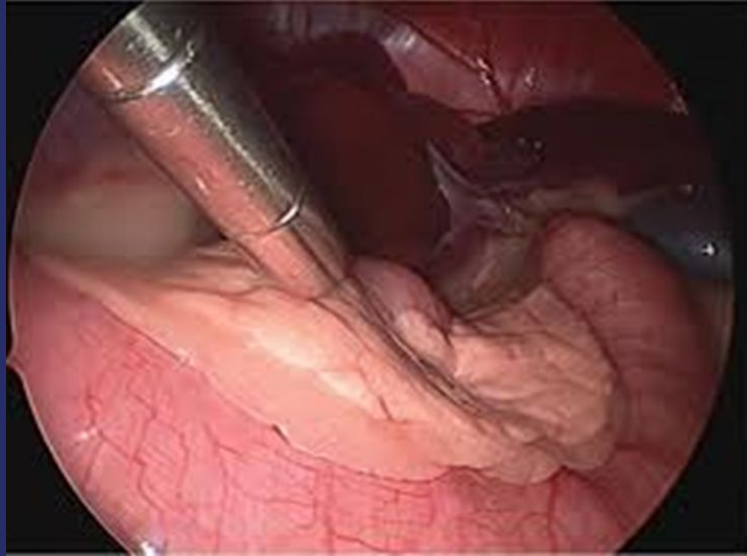
Minimally Invasive Surgery
(MIS)- Procedures under
endoscopic/fluoroscopic
guidance (Laparoscopy,
thoracoscopy, arthroscopy,
minimally invasive
osteosynthesis)



What is MIS?

- *Terminology*
- Laparoscopy
 - Abdomen and pelvis
- Thoracoscopy
 - Chest (thorax)
- Arthroscopy
 - Joint
- ALL
 - Endoscopy

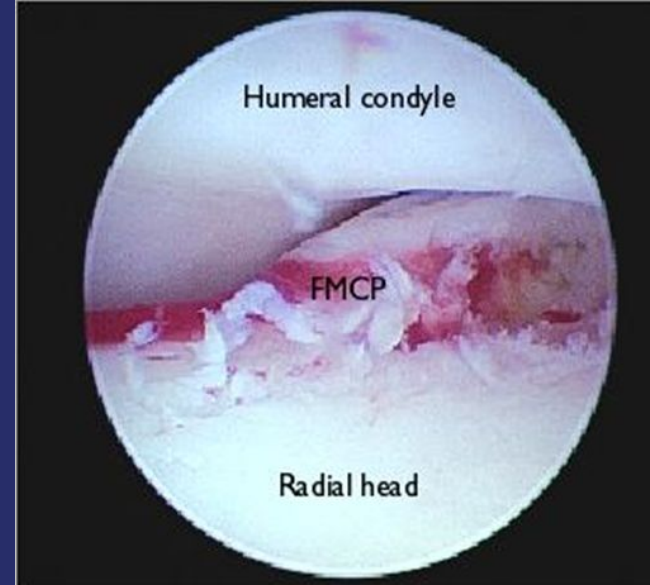
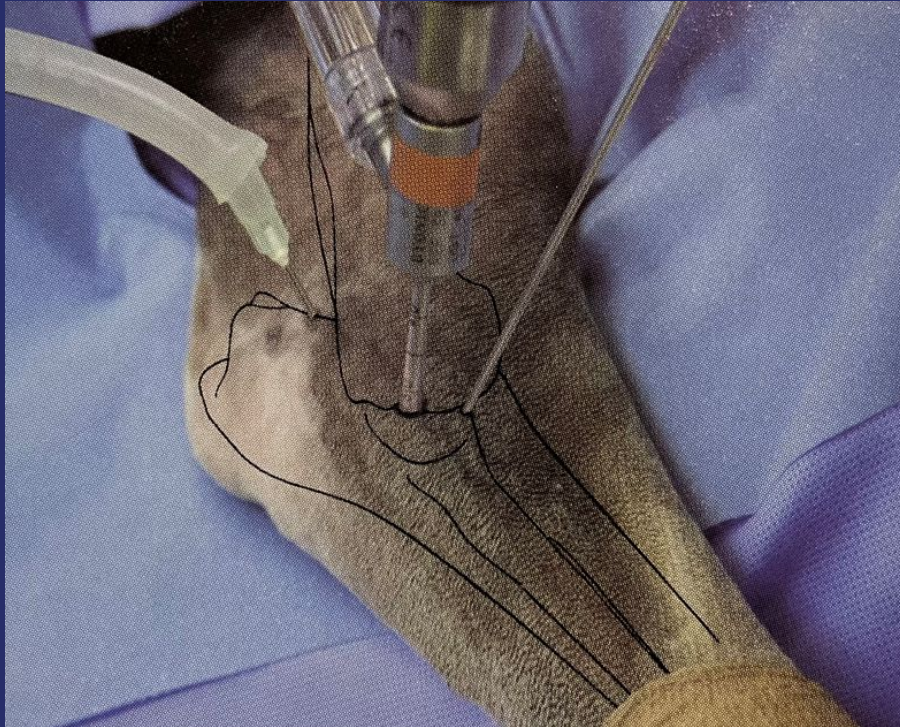
Laparoscopy



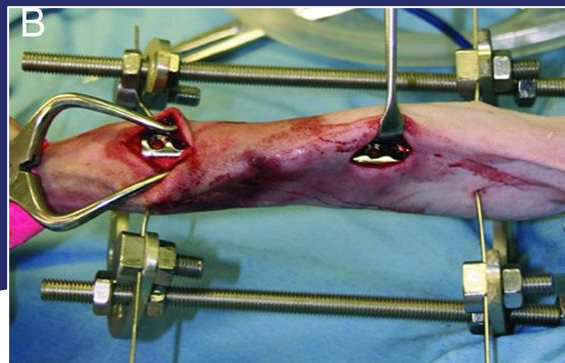
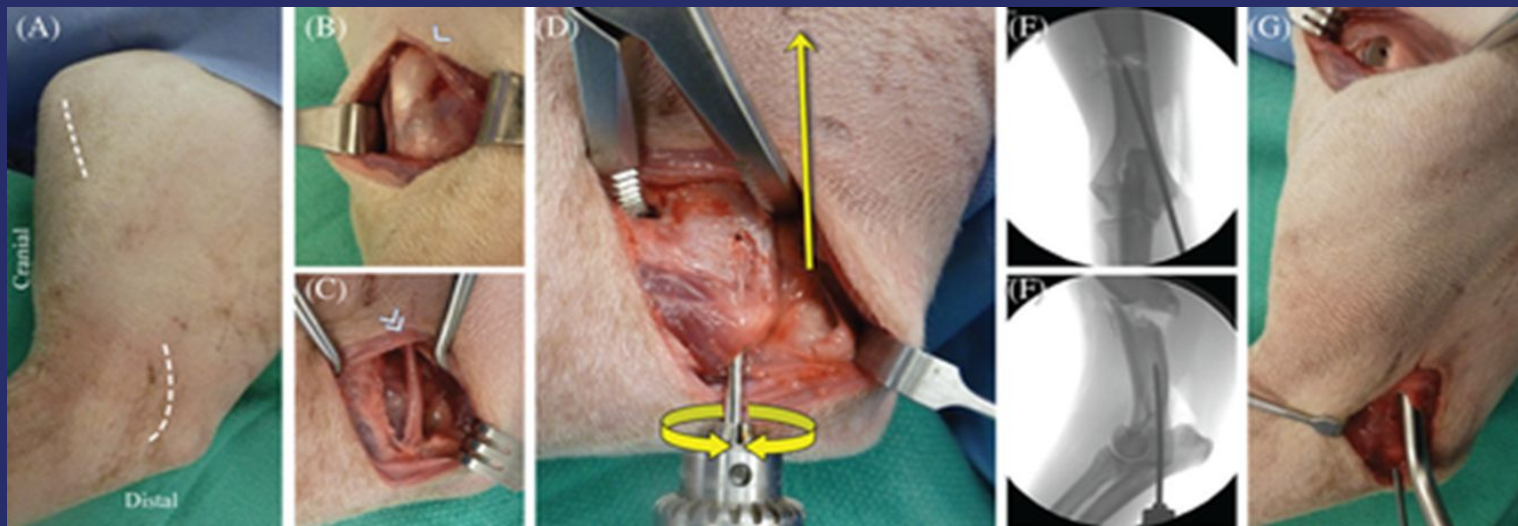
Thoracoscopy



Arthroscopy

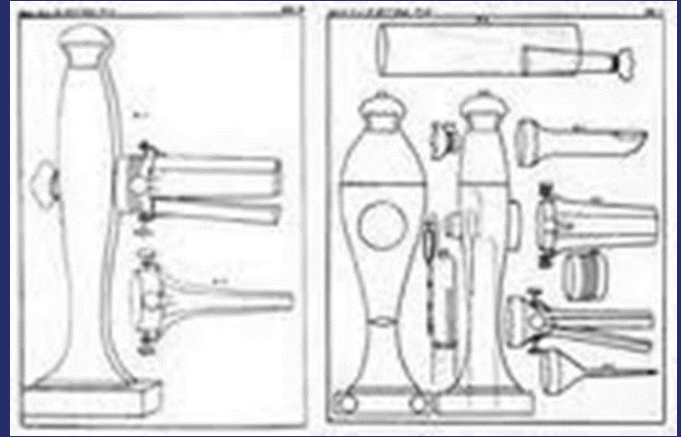


MIPOS



Historical perspective

- 1585- Aranzi first to use light source to evaluate the nasal cavity
- 1853 - Antonie Jean Desormeaux “father of Endoscopy” utilized the Lichtleiter aluminum tube illuminated by wax candle and mirrors
- 1868 - Kussmaul first esophagogastrosocopy via a professional sword swallower



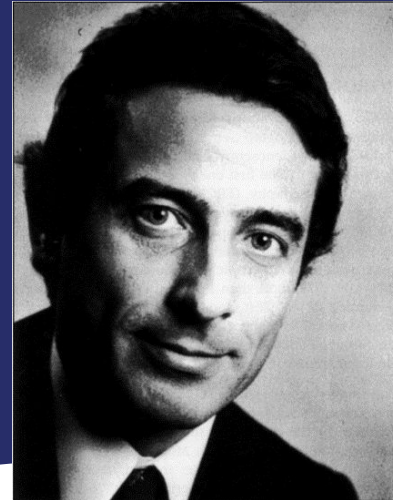
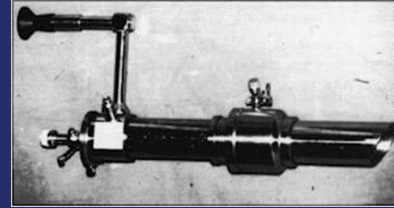
Historical perspective

1901- Georg Kelling Germany 1st
laparoscopic procedure dog



Historical perspective

- 1910 Hans Christian Jacobaeus
Sweden- First human Laparoscopic procedure
- 1975 Tarasconi first organ resection
Salpingectomy
- 1981 Semm (Germany) first
appendectomy
- 1985 Erich Muhe (Germany) first
Cholecystectomy
- Approximately 90% of gallbladder
removal is done with a scope in the
US



Why MIS?

- Patient Advantages
- Client Advantages
- Surgeon Advantages



Patient Advantages

- Decreased stress
- Decreased pain
- Increased return to normal activity
- Decreased incisional complications

○

Client Advantages

- Since the mid-late 1980's in human medicine there has been an increase in abdominal and thoracic procedures performed using MIS
- 90% of Cholecystectomies are performed laparoscopically (US and England) in people
- Expectations in our clients are changing
- Inevitably technology/advancements in surgery are expected

Surgeon Advantages

- Superior visualization magnification
- Decreased surgical times come with experience-decreasing surgery and anesthesia time reduce incidence of complications
- Increased versatility

Disadvantages

- Equipment
- Learning curve
- Decreased dexterity
- No tactile sensation

What is MIS?

- *Terminology*
- Endoscopic-assisted procedure- Utilizing endoscopic equipment but creating a larger incision than total endoscopic procedure or utilizing the advantages of visualization
- Extracorporeal- Outside the cavity. Commonly used to describe manipulations of the scope outside the cavity and in some cases procedures such as suturing
- Intracorporeal- Inside the cavity. Commonly used to describe manipulations of instruments within the cavity such as ligation

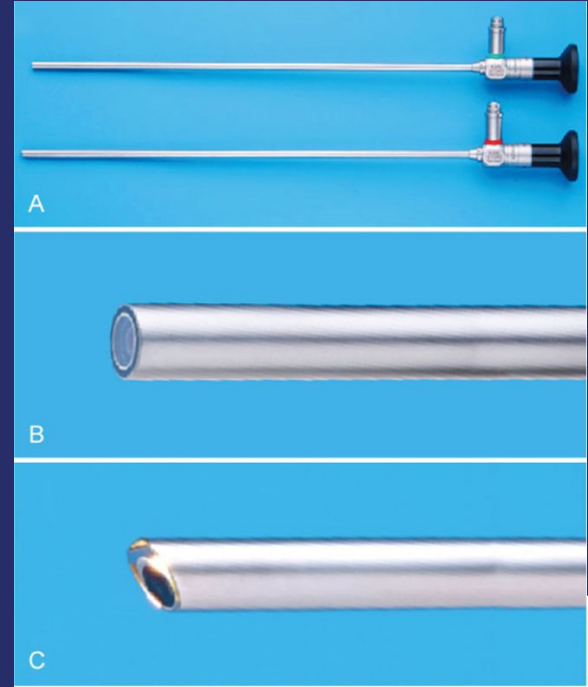
Laparoscopy

- Insufflation of the abdomen with CO₂
- Placement of scope port
- Placement 1-2 Instrument ports



Equipment

- Rigid Telescope—Allows a visual image to be transmitted to the camera. They are composed of a series of glass lenses arranged in a narrow tube to transmit light
- 2.7, 5, and 10mm
- 0 degrees and 30 degrees



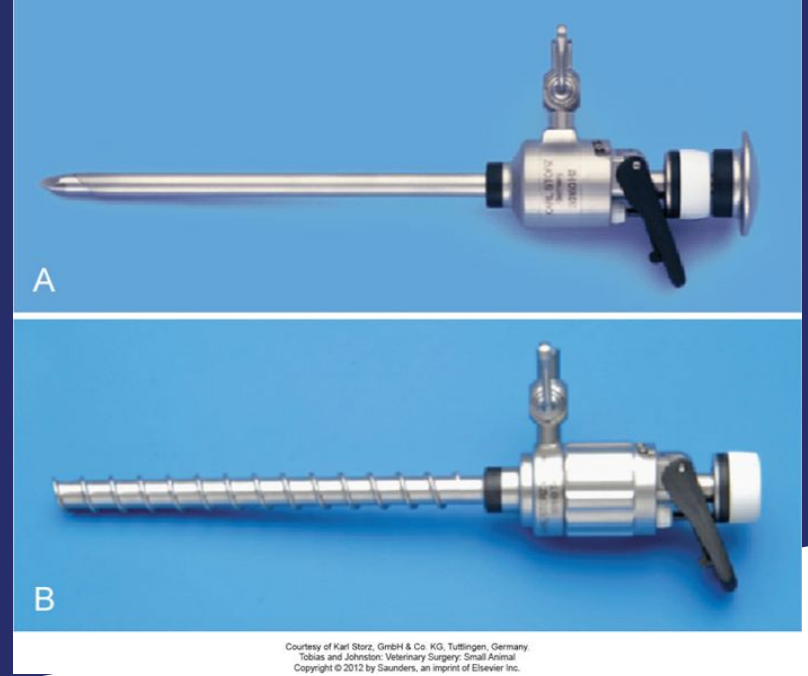
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Equipment

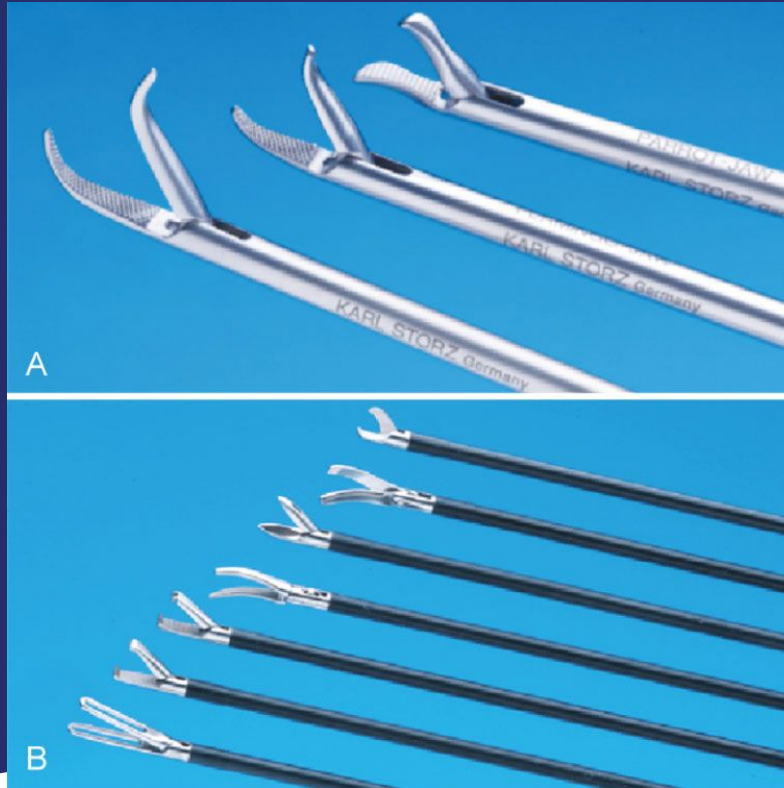


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Rigid endoscopic instruments



Rigid endoscopic instruments



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Hemostasis

- Staplers
- Vessel sealing device
 - Electrothermal sealing device that precisely delivers the amount of energy to permanently seal a vessel



Hemostatsis

- Hemostatic agents
 - Gelfoam
 - Surgicel
- Suturing techniques
 - Intracorporeal
 - Extracorporeal
- Electrocautery
 - Monopolar
 - Bipolar



Single vs Multiport

- Single port and Multiport procedures
 - OVE
 - Lap assisted Gastropexy
 - Foreign body
 - Intestinal biopsy
 - Hepatic Biopsy
 - Cryptorchidectomy
 - Pancreatic Biopsy

Single port- SILS port

- 2-3 cm mini-laparotomy
- 3 5mm ports
- Ease of insertion and reinsertion
- Fits snugly



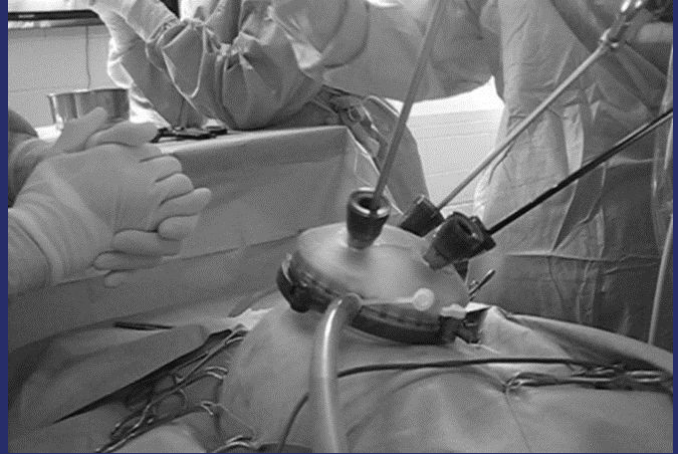
Endocone port

- 3 cm mini-laparotomy
- Advantage that it can be removed repeatedly without compromising reinsufflation



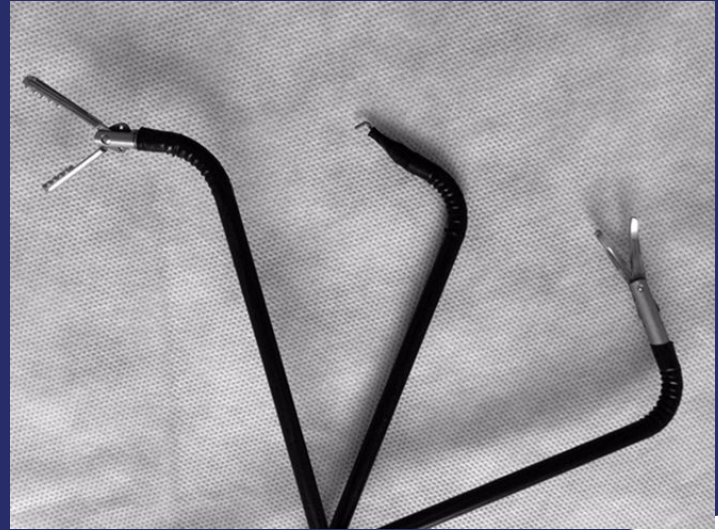
GePOINT Access System

- 2-7cm minilaparotomy
- Can accommodate 7cm incision allows large tissue removal
- Remove and reattach repeatedly



Articulating Graspers

- Designed to be offset from straight to allow freedom to move and triangulate



Laparoscopic Assisted Procedures

- Lap assisted Cystotomy
- Urolith retrieval procedures
- Lap assisted Gastropexy
- Intestinal surgery
 - Enterotomy
 - Enterectomy

Natural Orifice Transluminal Endoscopic Surgery (NOTES)

- Gains access to the abdomen via natural orifices.
 - Esophagus
 - Through stomach wall
 - Through vaginal wall

THORACOSCOPY PROCEDURES

- Biopsy
- Pericardial window
- Subtotal Pericardectomy
- Lung lobectomy
- Mass removal
- Foreign body removal
- PRAA ligation

Commonly performed Laparoscopic Procedures

- Diagnostic Laparoscopy
- Ovariectomy, OVH
- Cryptorchidectomy
- Lap assisted gastropexy
- Lap assisted Cystopexy
- Lap assisted colopexy
- Percutaneous cystolithotomy

LAPAROSCOPIC OVARIECTOMY

- OVH vs OVE
 - No increased complications
 - Hemorrhage the same
 - Less vaginal bleeding
 - More often associated with the ligature on the uterus

LAPAROSCOPIC OVARIECTOMY

- OVE vs OVH Complications
 - Less chance of ligating the ureter
 - No stump granuloma
 - No increase in Pyometra or endometritis
 - .003% chance of Malignant uterine tumor
 - No increase in urinary incontinence

LAPAROSCOPIC OVARIECTOMY VS OPEN OVH

Patient Advantages

- Decreased stress
- -Less tissue damage, shorter hospitalization, less effect on GI function
- -Biochemical stress indicators blood glucose and cortisol are less as when a laparoscopic procedure is compared to an open OVH. (1)
- Decreased pain-
 - Smaller focused incision
 - When comparing open vs. Laparoscopic OVH the relative risk of requiring additional post-op pain medication was 10 times greater with an open approach. (1,2

LAPAROSCOPIC OVARECTOMY VS OPEN OVH

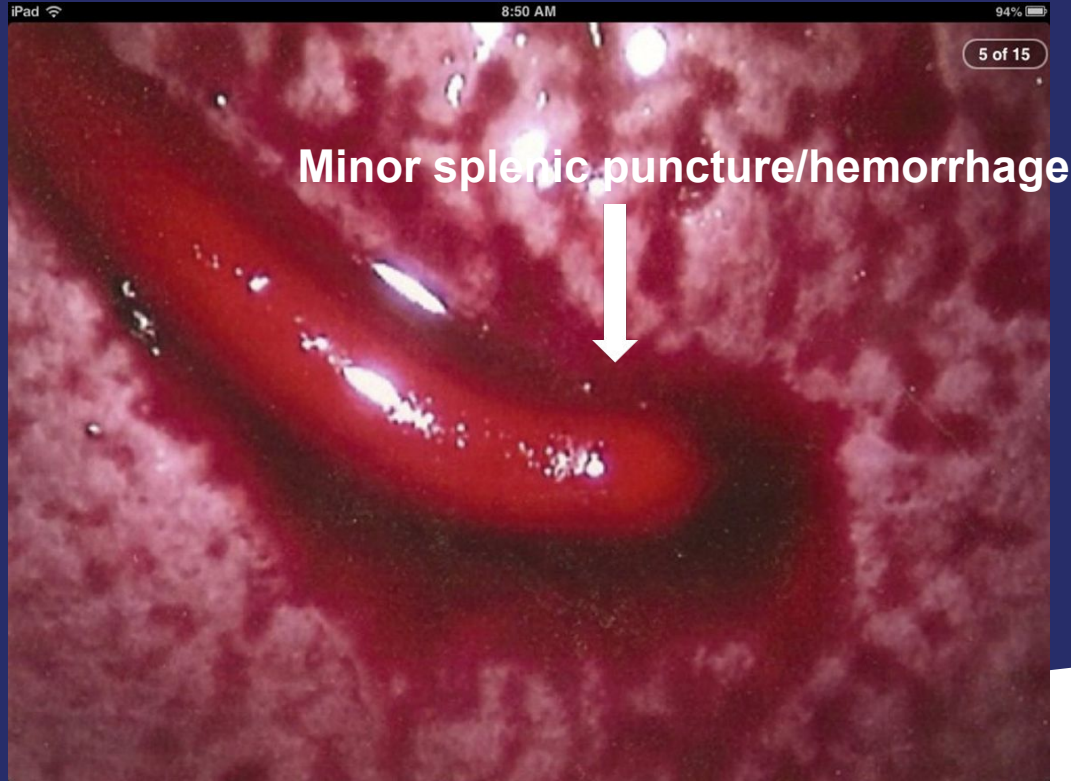
Patient Advantages

- **Increased return to normal activity-**
 - Study comparing open OVE to laparoscopic OVE with the use of an activity monitor found that open OVE had a decrease of 62% of baseline and laparoscopic OVE had 25% decrease. (3)
- **Decreased incisional complications-**
 - Less risk of post-op seroma, dehiscence, infection—taken from general texts and human literature
 - Benefit immune compromised patients or slow healers

Complications Lap OVE or OVH

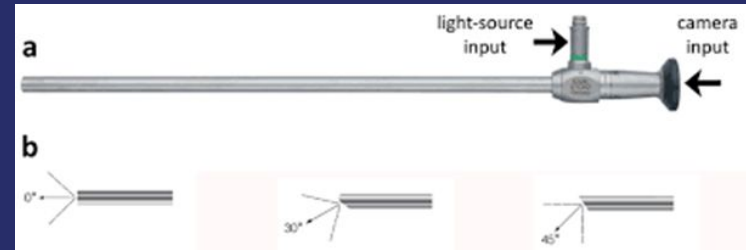
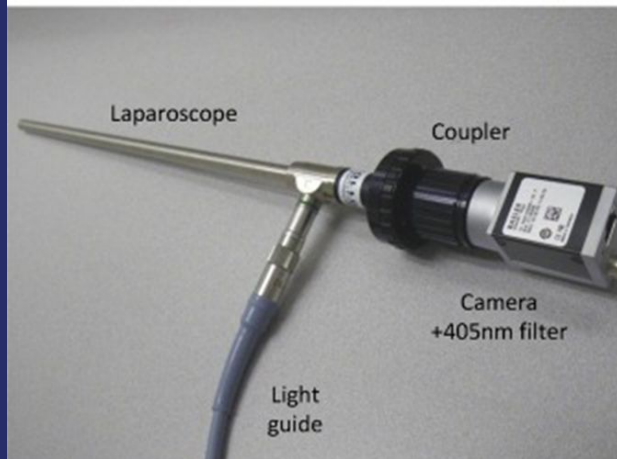
- Subcutaneous CO2
- Omental herniation
- Seroma
- Inadvertent damage to other organs
- Gas Embolism
- Pneumothorax

Complications Lap OVE or OVH

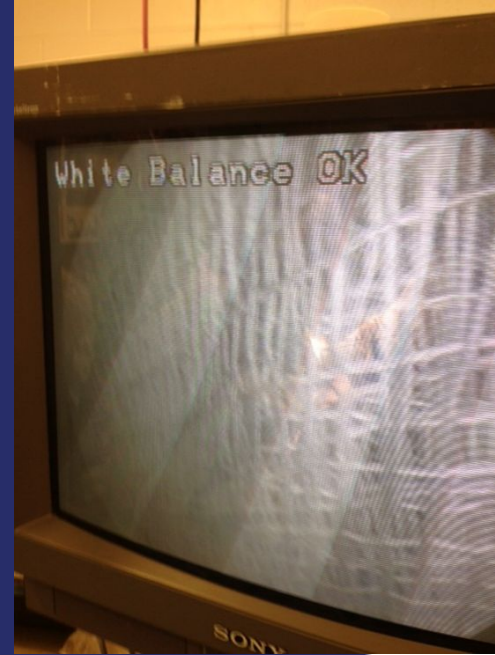


SCOPE SET UP

- Attach light source
- Attach the camera



White Balance



Warm scope



- Place in warm saline to adjust to temperature of abdomen

LAPAROSCOPY

- Place the animal in dorsal recumbency
- Drape as you would for an open procedure
 - Be sure to drape so can access the site for ovariectomy hook (or #2 Nylon) placement
- Make a stab incision with #11 blade halfway between xiphoid and the umbilicus



LAPAROSCOPY

- Place the Veress needle into the abdomen
- Insufflate with CO2
-



LAPAROSCOPY

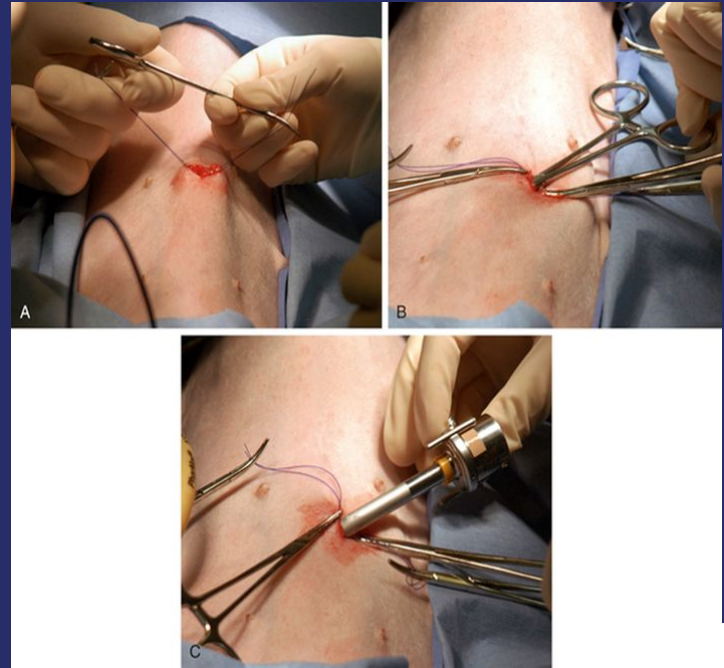
- Make a second stab incision with a #11 blade
- Just caudal to the umbilicus
- Place the cannula with the trocar in this site
- Insufflation tubing is moved from veress needle to cannula



LAPAROSCOPY

Modified Hassan Technique

- • Incise abdomen
- • Put stay sutures in linea
- • Elevate linea
- • Stab incision into abdomen
- • Place trocar into incision with linea elevated



Capnoperitoneum

- Insufflate the abdomen to 10mm Hg
- Lower risk of embolization than other gases
- Increases work space in the abdomen
- Increased Intra abdominal pressure
 - Reduces diaphragm excursions
- Decreased cardiac output
 - If IAP 10-12 mm Hg then CO within physiologic limits
- Increase arterial pressure

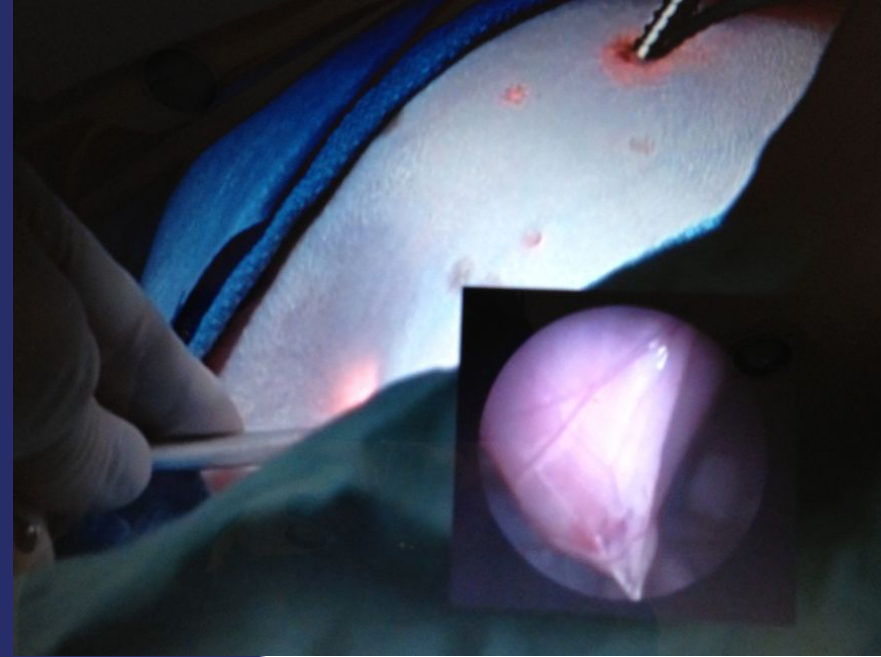
LAPAROSCOPY

Place the 5mm scope into the abdomen and visualize the Veress needle.



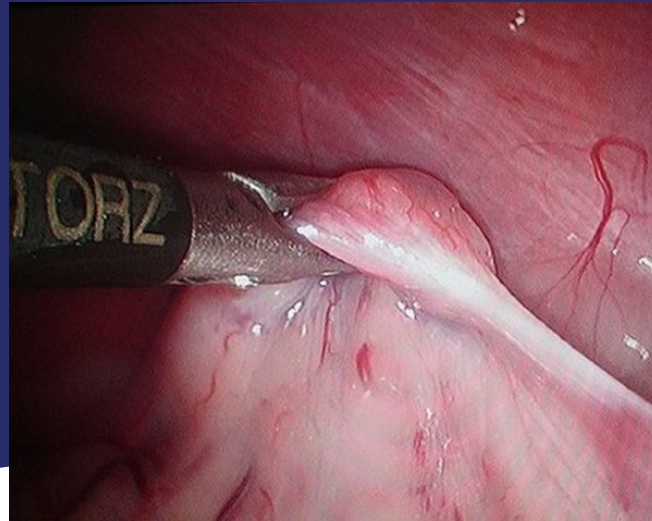
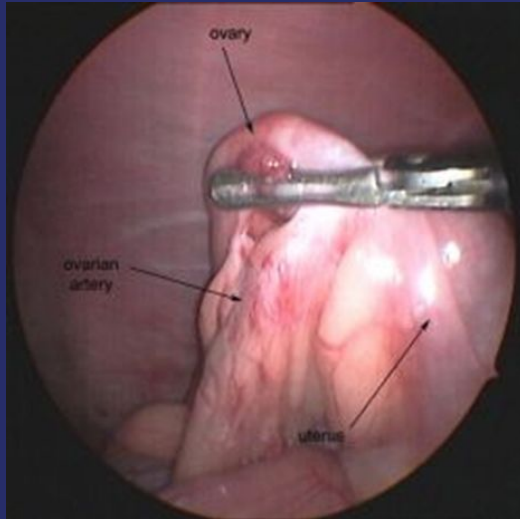
OVARIECTOMY

- Remove Veress needle and place the second cannula at the site of the Veress needle
 - Visualize the insertion of the blade and the cannula with the scope



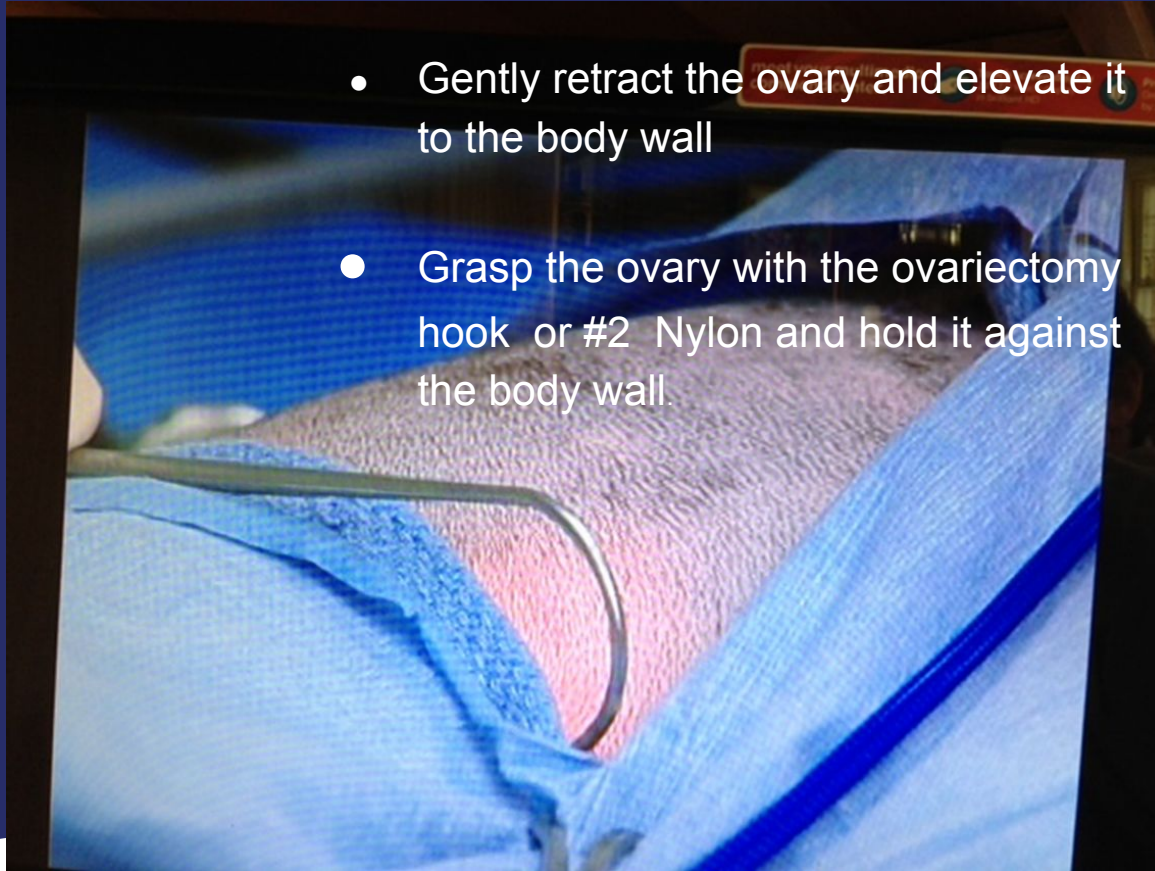
OVARIECTOMY

- Rotate patient toward the surgeon
- Insert the babcock forceps through the caudal portal and grab ovary



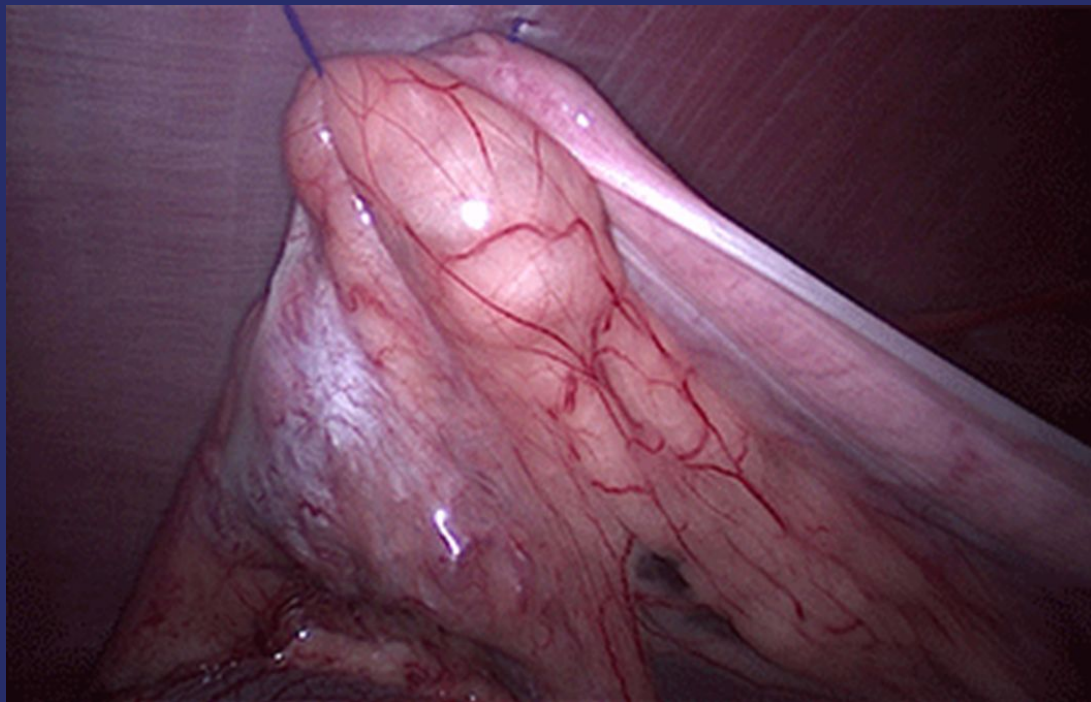
OVARIECTOMY

- Gently retract the ovary and elevate it to the body wall
- Grasp the ovary with the ovariectomy hook or #2 Nylon and hold it against the body wall.



OVARIECTOMY

- #2 Nylon and hold it against the body wall



OVARIECTOMY

- Cauterize and cut the ovarian vessels, ligament and uterus



OVARIECTOMY

- Once the ovary is isolated grasp it with the babcock
- Leave it attached to the #2 nylon suture
- Rotate the animal back to the center position
- Repeat the procedure for the other side
- Pull the ovary from the abdomen and remove the cannula
- Replace the cannula and rotate the animal and pull the ovary that was left attached to the #2 nylon

CLOSURE

- Evaluate for any hemorrhage
- Evacuate all the CO₂ from the abdomen
- Close the linea with 3-0 PDS
- Close the skin

LIVER BIOPSY

- Indications for liver biopsy
 - Chronic liver enzyme elevation
 - Liver changes visible on ultrasound
 - Liver Masses

LIVER BIOPSY

- Pre op Tests
 - PT
 - PTT
 - Platelet count
 - CBC
 - Chemistry panel

LIVER BIOPSY

- Techniques for Liver Biopsy
 - Ultrasound guided needle biopsy
 - Less accurate – agreed with wedge biopsy only 48% of the time
 - Open
 - Good biopsy samples
 - Larger incision

LIVER BIOPSY

Laparoscopic

Benefits

- Low morbidity 7.5 % complications

- Great visibility

 - Can visualize tissue being biopsied and post biopsy hemorrhage

- Preserves tissue architecture

Drawbacks

- Special equipment

- Expense

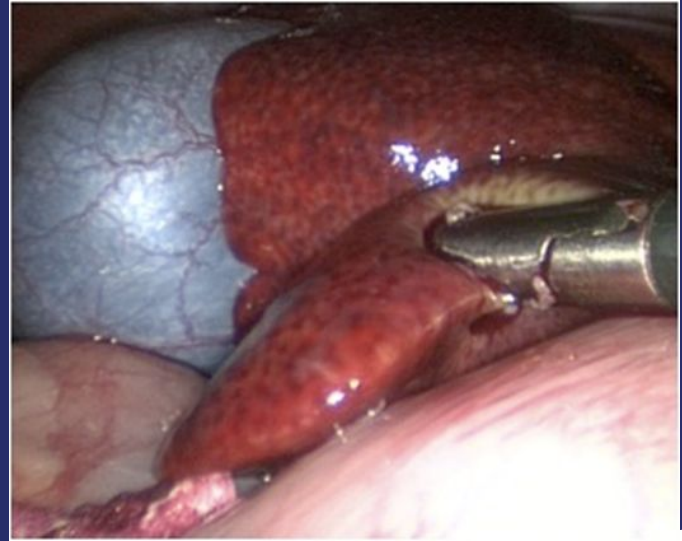
- Extra training

LIVER BIOPSY

- Place the animal in dorsal recumbency
- Initial port caudal to umbilicus
- Biopsy with 2 port technique

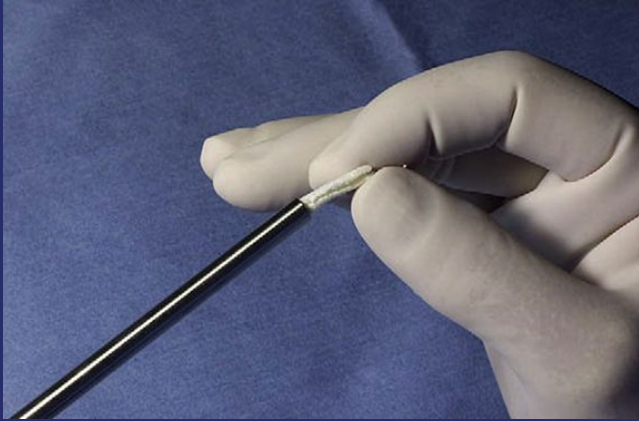
LIVER BIOPSY

- Explore the abdominal cavity
- Inspect the liver
- Take multiple biopsy samples
- Inspect for bleeding



LIVER BIOPSY

Gel foam is loaded into tube to introduce into the abdomen



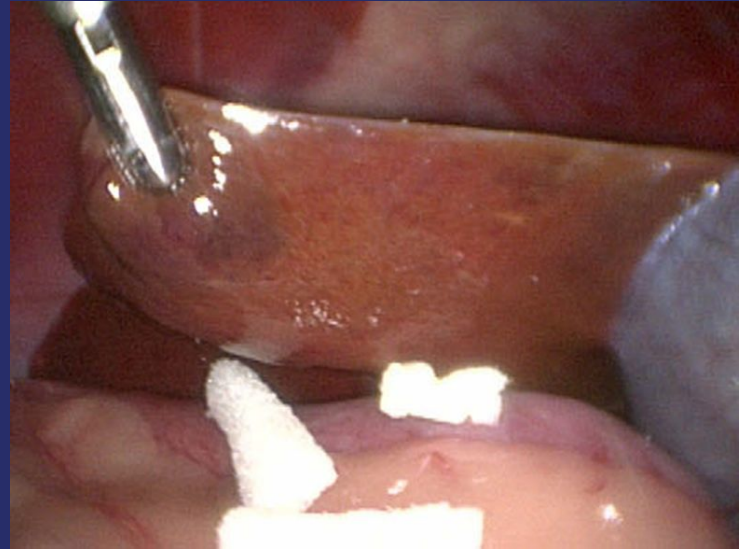
The Gelfoam is pushed into the abdomen with a plastic rod



If bleeding excessive can apply Gelfoam

LIVER BIOPSY

- Liver is grasped with 5mm biopsy cup forceps.
- It is held for 30 seconds and then removed



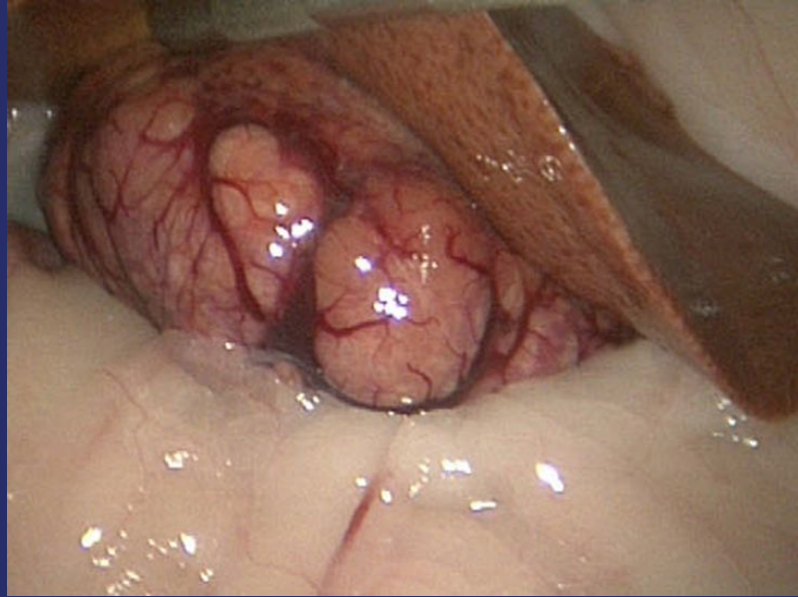
LIVER BIOPSY

- Gelfoam that was placed into the abdomen through the tube was then inserted into the biopsy sites.
- The gelfoam is held in place for 1 minute



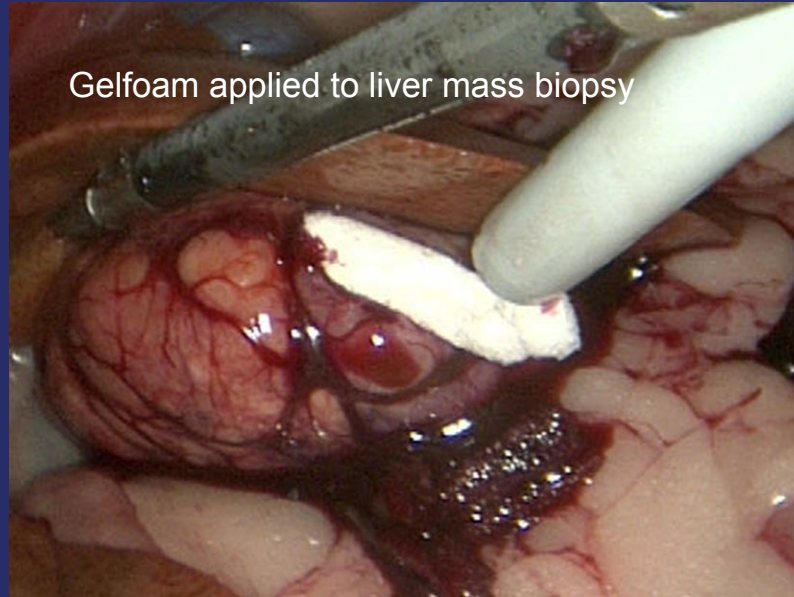
LIVER BIOPSY

Biopsy of Liver mass



LIVER BIOPSY

- Complications 7.5%:
 - Conversion to open
 - Transfusion
 - Most frequently occurred in thrombocytopenic animals

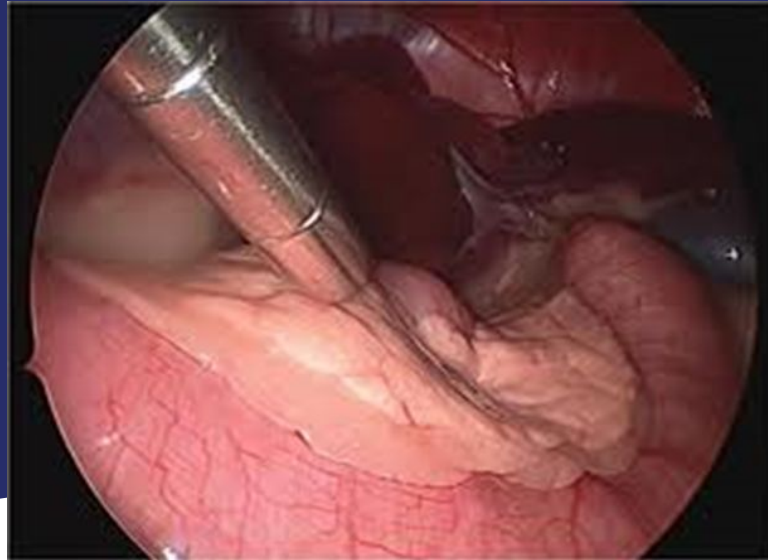


PANCREATIC BIOPSY

- INDICATIONS:
 - Pancreatitis
 - Pancreatic masses

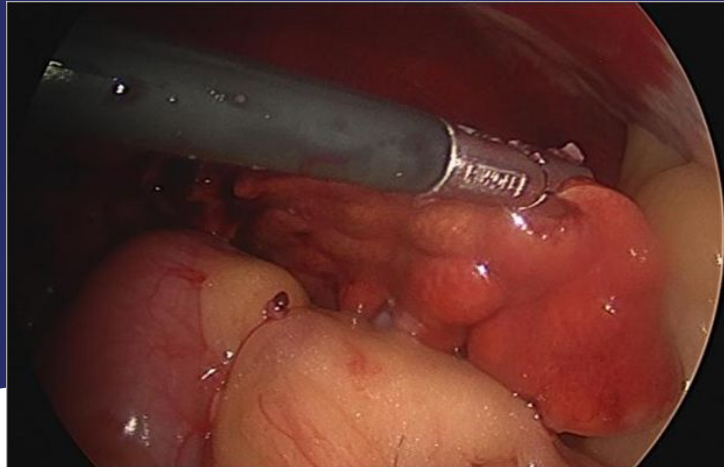
PANCREATIC BIOPSY

- Obtained with minimal or no complications
- Visualize right limb of pancreas
- Use biopsy punch forceps that are sharp



PANCREATIC BIOPSY

- Biopsy a piece at the edge of the pancreas and away from the ducts and large vessels
- Complications
 - Rare
 - Little or no post op pancreatitis



KIDNEY BIOPSY

- Used to evaluate renal masses and glomerular disease
 - Need 2-3 biopsy samples
- Biopsy sample needs to include
 - Intact glomeruli
 - renal arterioles
 - Cortical interstitium

KIDNEY BIOPSY

- If both kidneys needed to evaluate then dorsal recumbency
- If only one kidney then place in lateral with affected kidney up
- Use right kidney if possible because less movable

KIDNEY BIOPSY

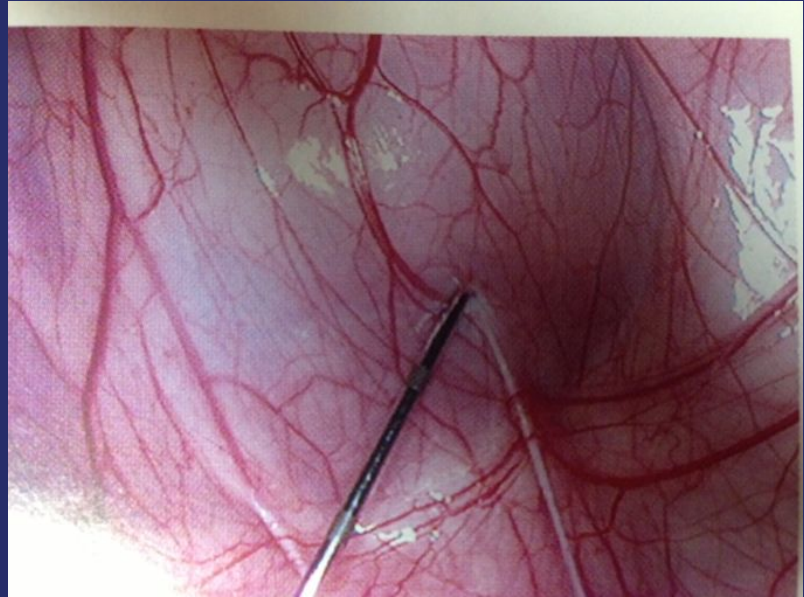
- Choose an entry site caudal to the diaphragm to avoid penetration into the chest
- Make stab incision
- Visualize site with scope
- Pass the biopsy needle through the body wall
- Stabilize the kidney with grasping forceps

KIDNEY BIOPSY

Pass needle through the renal cortex avoiding the large vessels at the corticomedullary junction.

Direct biopsy needle through the cranial pole of the kidney

Use probe to apply pressure to site of biopsy to minimize bleeding post biopsy



GASTROPEXY

- GDV Life threatening emergency
- Gastropexy done to prevent volvulus

Lap Assisted Gastropexy

- Indicated for prophylactic gastropexy in large breed dogs prone to torsion
- Can be done at the time of routine spay or neuter with limited incision
- Fast recovery

Lap Assisted Gastropexy

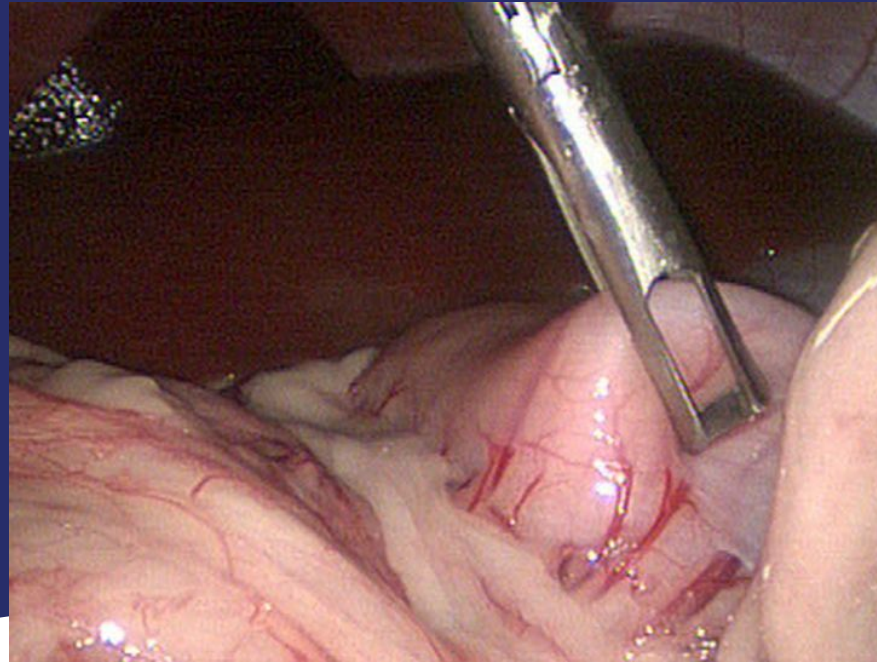
- Rawlings showed that the tensile strength of Lap assisted Gastropexy is equal to other Gastropexy techniques.
- 20 dogs followed 1 year post operatively still had adhesion at pexy site as seen on ultrasound

Lap Assisted Gastropexy

- Routine camera placement
- Second portal on right 2-3 cm behind last rib and off midline.
(visualize port placement as before)
- Identify pylorus in right lateral abdomen
- Pexy the antrum of the stomach exteriorized through right abdominal wall
-

Lap Assisted Gastropexy

The stomach is grasped with Babcock forceps about 5cm proximal to the pylorus



Lap Assisted Gastropexy

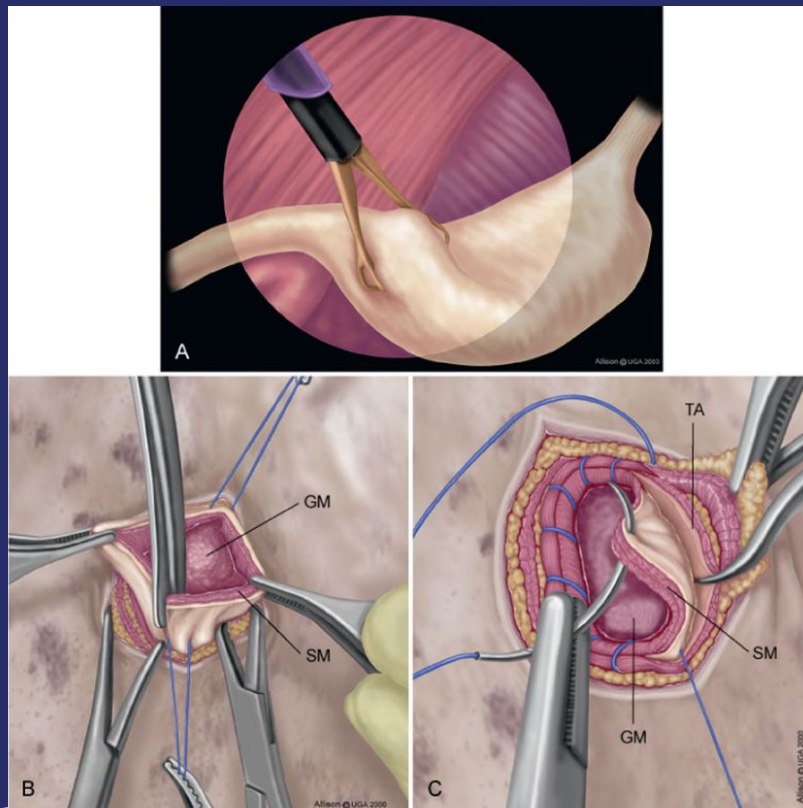
Using the Babcock forceps the stomach is pulled to the body wall



Lap Assisted Gastropexy

- The instrument portal incision is increased to 5 cm
- The stomach is pulled through the body wall
- Place 2 stay sutures in the stomach wall
- Make a 3-5 cm incision in the stomach through serosa and muscularis
- Create 2 seromuscular flaps using metzenbaums
- Use 3-0 PDS to suture the seromuscular flap to transverse abdominus muscle
-

Lap Assisted Gastropexy



From Rawlings CA, et al: A rapid and strong laparoscopic-assisted gastropexy in dogs. Am J Vet Res 62:871, 2001.
Tobias and Johnston: Veterinary Surgery: Small Animal
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Lap Assisted Gastropexy

- Close with 2-0 or 3-0 PDS in a continuous pattern then routine closure
- Reinsufflate the abdomen to assure that no twisting of the stomach occurred

Lap Assisted Gastropexy

View of completed gastropexy through the laparoscope

Tensile strength of Lap assisted gastropexy equal to other techniques

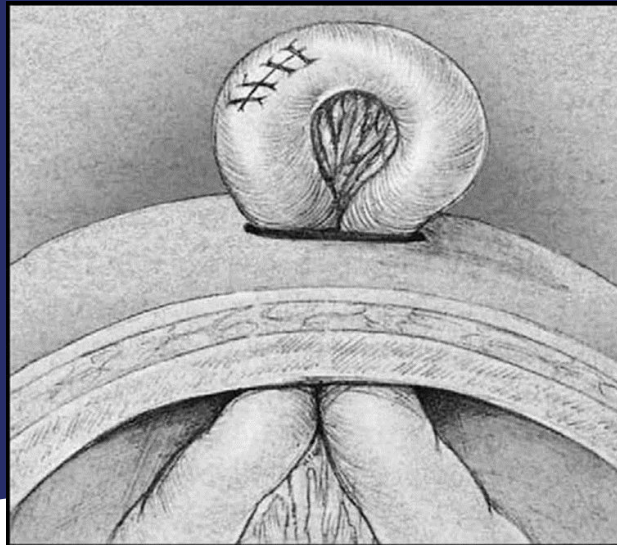


Lap Assisted Gastropexy

- Post operative Treatment:
 - Analgesics
 - Discharge the following day
- Complications:
 - Seroma at the incision site which can usually be managed conservatively

INTESTINAL BIOPSY

- Intestine is pulled through umbilical trocar site
 - Biopsy
 - Resection and anastomosis



INTESTINAL BIOPSY

- Extend umbilical port 5cm
- Grab intestine with a babcock
- Trace the intestine from the stomach to the colon
- Isolate section for the biopsy

INTESTINAL BIOPSY

- Perform a routine full thickness biopsy
- Wrap the biopsied section in omentum
- Return to abdomen
- Reinsert camera and inspect and lavage the abdomen

INTESTINAL BIOPSY

- Full thickness intestinal biopsies are preferred to mucosal biopsy samples
- Evans et al compared mucosal biopsies with full thickness biopsies.
 - 4 out of 19 animals were incorrectly diagnosed with IBD from endoscopic biopsy when they actually had Lymphosarcoma (which was diagnosed on full thickness biopsy).

WHAT MIS WE CAN DO FOR YOU

- Ovariectomy
- Cryptorchidectomy
- Biopsies
- Liver
- Kidney
- Pancreas
- Intestine
- Lap Assisted Gastropexy
- Cystotomy/Cystopexy
- Urinary Bladder polypectomy



WHAT MIS WE CAN DO FOR YOU

- Biopsy
- Pericardial window
- Subtotal
Pericardectomy
- Mass removal
- Foreign body removal



THE FUTURE

Robotic Surgery

Endoscopic Fluorescent Imaging

REFERENCES

1.http://www.google.com/search?hl=en&site=imghp&tbm=isch&source=hp&biw=757&bih=764&q=laparoscopic+ovariectomy+canine&oq=laparoscopic+ovariectomy+canine&gs_l=img.12...3504.15726.0.17355.34.9.2.23.1.0.112.597.8j1.9.0...0.0...1ac.1.8.img.6PHktwD-ur0#imgsrc=ZwjQDQJGWpfu1M%3A%3BBNOH4nQ5gD12NM%3Bhttp%253A%252F%252Fwww.rvc.eclipse.co.uk%252Fimages%252Fflap2.jpg%3Bhttp%253A%252F%252Fwww.rvc.eclipse.co.uk%252Fservices4.html%3B449%3B358

2.2. Runge JJ, Curcillo PG , King SA et al. Initial Application of reduced port surgery using the single port access technique for laparoscopic canine ovariectomy. Vet Surg 2012: 41(7) pp.803-806.

3.http://www.google.com/search?hl=en&site=imghp&tbm=isch&source=hp&biw=757&bih=764&q=laparoscopic+ovariectomy+canine&oq=laparoscopic+ovariectomy+canine&gs_l=img.12...3504.15726.0.17355.34.9.2.23.1.0.112.597.8j1.9.0...0.0...1ac.1.8.img.6PHktwD-ur0#imgsrc=xd8SjKpXewAHBM%3A%3B3iQEIR_I95Ez6M%3Bhttp%253A%252F%252Fwww.vet.utk.edu%252Fclinical%252Fsacs%252Finternal%252Fimg%252Fimg008-liver-lobe.jpg%3Bhttp%253A%252F%252Fwww.vet.utk.edu%252Fclinical%252Fsacs%252Finternal%252Fmips

REFERENCES

4.

http://www.google.com/search?hl=en&site=imghp&tbm=isch&source=hp&biw=757&bih=764&q=laparoscopic+ovariectomy+canine&oq=laparoscopic+ovariectomy+canine&gs_l=img.12...3504.15726.0.17355.34.9.2.23.1.0.112.597.8j1.9.0...0.0...1ac.1.8.img.6PHktwD-ur0#hl=en&site=imghp&tbm=isch&sa=1&q=laparoscopic+pancreatic+biopsy+canine&oq=laparoscopic+pancreatic+biopsy+canine&gs_l=img.12...102780.111679.0.113461.19.19.0.0.0.0.101.978.18j1.19.0...0.0...1c.1.8.img.0K9of4vhDoM&bav=on.2.or_r_qf.&bvm=bv.44770516,d.dmQ&fp=2865644c07b4acda&biw=1855&bih=908&imgsrc=E36mZPOuwwmEvM%3A%3BLSm2WigCE7ahxM%3Bhttps%253A%252F%252Fs3.amazonaws.com%252Fassets.prod.vetlearn.com%252Ff2%252F2452d0c77611e087120050568d3693%252Ffile%252FACVSbox.gif%3Bhttp%253A%252F%252Fwww.vetlearn.com%252Fcompendium%252Fsurgical-views-techniques-for-laparoscopic-and-laparoscopic-assisted-biopsy-of-abdominal-organs%3B312%3B353

5.

http://www.google.com/search?hl=en&site=imghp&tbm=isch&source=hp&biw=757&bih=764&q=laparoscopic+ovariectomy+canine&oq=laparoscopic+ovariectomy+canine&gs_l=img.12...3504.15726.0.17355.34.9.2.23.1.0.112.597.8j1.9.0...0.0...1ac.1.8.img.6PHktwD-ur0#hl=en&site=imghp&tbm=isch&sa=1&q=laparoscopic+pancreatic+biopsy+canine&oq=laparoscopic+pancreatic+biopsy+canine&gs_l=img.12...102780.111679.0.113461.19.19.0.0.0.0.101.978.18j1.19.0...0.0...1c.1.8.img.0K9of4vhDoM&bav=on.2.or_r_qf.&bvm=bv.44770516,d.dmQ&fp=2865644c07b4acda&biw=1855&bih=908&imgsrc=qwvHi4JYagGF2M%3A%3Bqcoq-dflbE45tM%3Bhttp%253A%252F%252Fsmallanimal.vethospital.ufl.edu%252Ffiles%252F2011%252F10%252FPancreas1.jpg%3Bhttp%253A%252F%252Fsmallanimal.vethospital.ufl.edu%252Fclinical-services%252Finternal-medicine%252Fendoscopy%252Fabdominal-endoscopy%252F%3B640%3B465

6.Rawlings CA, foutz TL, MahaffeyMB, et al. A rapid and strong laparoscopic-assisted gastropexy in dogs. Am J Vet Res 2001;62(6):871-5.

REFERENCES

6. Tankersley T. Laparoscopic Spays in Dogs and Cats. Karl Storz video. 2006
7. Twedt DA, Monnet E. Laparoscopic-assisted Surgery in Dogs and Cats. Karl Storz video. 2007.
9. Mayhew PD. Complications of Minimally Invasive Surgery in Companion Animals. Vet Clinics Small Animal 41 (2011);10017-1021.
10. https://d12geb6i3t2qxd.cloudfront.net/webinar_resources/uploads/2016/11/Notes-Webinar-vet-laparoscopy-1.pdf. Hall, J.: Through the Keyhole: veterinary laparoscopy
11. Townsend, F: Minimally Invasive surgery 2016
12. Rawlings CA et al: A rapid and strong laparoscopic-assisted gastropexy in dogs. Am J Vet Res 82871, 2001. Tobias and Johnston Veterinary Surgery: Small Animal Copyright 2012 by Saunders, an imprint of Elsevier Inc.

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