

Simbionix Suggested Implementation of the ACS/APDS Surgical Skills Curriculum for Residents, Phase 2: Advanced Procedures

Description

Training with a proficiency-based virtual reality simulator in combination with the specific guidelines set forth by American College of Surgeons/ Association of Program Directors in Surgery Surgical Skills Curriculum for Residents Phase 2: Advanced Procedures creates an optimal learning environment for participants.

This curriculum aims to provide the participant with the essential education materials and simulation assignments needed to acquire the skills and core competencies in those procedures deemed essential to the general surgeon. The curriculum adheres to the objectives outlined by ACS/APDS and their corresponding training modules. When applicable, the use of Simbionix simulations is incorporated within the modules to provide skills training.

Objectives

- ◆ To gain knowledge of the following procedures from the ACS/APDS Phase 2 curriculum using video-based didactic learning:
 - Laparoscopic Ventral Hernia Repair
 - Open Colon Resection, Lap Right Colon Resection
 - Laparoscopic Sigmoid Resection
 - Open Right Colon Resection
 - Laparoscopic/Open Bile Duct Exploration
 - Laparoscopic Ventral/Incisional Hernia Repair (Porcine Model)
 - Laparoscopic Appendectomy
 - Laparoscopic Nissen Fundoplication
 - Sentinel Node Biopsy & Axillary Lymph Node Dissection
 - Open Inguinal/Femoral Hernia Repair
 - Laparoscopic Inguinal Hernia Repair
 - Laparoscopic/Open Splenectomy
 - Laparoscopic/Open Cholecystectomy
 - Gastric Resection & Peptic Ulcer Disease
 - Parathyroidectomy/Thyroidectomy

- ◆ To acquire and practice the skills required to perform the following procedures from the ACS/APDS Phase 2 curriculum in an inanimate setting on simulated operative cases:
 - Laparoscopic Ventral/Incisional Hernia Repair
 - Laparoscopic Sigmoid Resection
 - Laparoscopic Appendectomy
 - Laparoscopic Cholecystectomy
 - Gastric Bypass procedure

Specialties

General Surgery

Target Audience

Residency programs and residents interested in using Simbionix simulations while following the ACS/APDS Surgical Skills Curriculum for Residents to acquire the knowledge and skills necessary to perform the core set of procedures for a general surgeon.

Assumptions

Knowledge

Participants have a fundamental set of medical knowledge including basic anatomy and familiarization with basic instrumentation for open and laparoscopic procedures.

Basic Skills and Tasks

Possessing core skills and the ability to perform basic tasks is essential before mastering the procedural skills. To get the most from the curriculum, participants are expected to have to have successfully completed the ACS/APDS Surgical Skills Curriculum for Residents Phase 1: Basic/Core Skills and Tasks modules.

Suggested Time Length

Each module varies depending on the laboratory component but range from one to three hours. Didactic materials should take no longer than one hour to review with supplemental materials available for deeper study and review.

Authors

This curriculum strictly adheres to the advanced skills and procedures modules outlined in ACS/APDS Surgical Skills Curriculum for Residents Phase 2: Advanced Procedures defined by the National Simulation Curriculum Committee sponsored by the American College of Surgeons and the Association of Program Directors in Surgery. When possible, Simbionix has utilized other recognized experts to provide supplemental materials in their areas of expertise for each module:

George Crawford, MD. The Crawford Clinic, Anniston, AL.

*Philippe Topart, MD. Clinique de l'Anjou, Angers, France.
(SAGES, ASBMS)*

*Guillaume Becouarn, MD. Clinique de l'Anjou, Angers,
France.*

Module 1 - Laparoscopic Ventral Hernia Repair

1.1 Ventral Hernia Supplemental Videos

Description

This collection of videos by Dr. George Crawford of the Crawford Clinic in Anniston, AL demonstrates the steps for laparoscopic management of an incarcerated ventral hernia.

Incarcerated Hernia Notes

1. Introduction
 - a. Objective is to get a clear view of the hernia defect.
 - b. Note that the hernia is reduced following insufflation
2. Reduction of the Hernia Sac
 - a. The sac associated with the hernia must be pulled down.
 - b. If hernia is left intact, there is a greater possibility of complications such as fat necrosis after the hernia is removed or recurrent hernias.
3. Repair of Hernia with Suture
 - a. If the sac is pulled down, the chances of a small bowel entering the sac is decreased.
 - 4. Closure of Incision

Authors

George Crawford, MD. The Crawford Clinic, Anniston, AL.

1.2 Hands-on Incisional Hernia Module – 6 Cases

Description

6 easy to difficult hernia repair cases provide surgeons with true-to-life experience of laparoscopic incisional hernia repair in a controlled and safe environment. Trainees gain an in-depth understanding of abdominal anatomy, skills for carefully separating the adhesion to expose the hernia defect, appreciation of potential complications, and practice safe use of prosthetic mesh and devices used to fixate, suture and staple the mesh.

Objectives

- ◆ To learn the skills for carefully separating the adhesion to expose the hernia defect.
- ◆ To detect and learn how to avoid potential complications of the hernia procedure.
- ◆ To familiarize and practice safe use of prosthetic mesh, suturing and mesh fixation devices.

Specialties

General Surgery

Target Audience

Practicing surgeons as well as the residents/fellows interested in laparoscopic hernia procedure training and in becoming familiar with the instruments and techniques for performing this procedure.

Assumptions

Familiarity with basic laparoscopic skills

Suggested Time Length

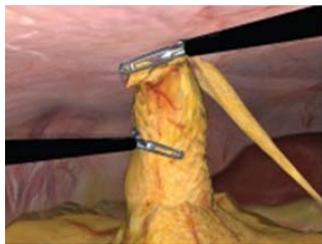
Suitable for training in 2 day courses- 4 hour hands-on training per day.

Authors

The cases were created in collaboration with:

Dr. Eduardo Parra-Davila, Colon & Rectal Surgery and General Surgery, Boca Raton, Florida.

1.2.1 Hands-on Incisional Hernia Module – 6 Cases



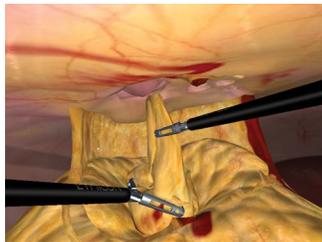
Case 1 - Umbilical Hernia

Medical History:

A 44-year-old female presented with umbilical hernia. Local examination revealed a lump of approximately 3 x 3 cm which becomes visible when coughing.

Pathology:

Umbilical hernia where the hernia content is incarcerated inside the defect with no adhesions and features round ligament of the liver.



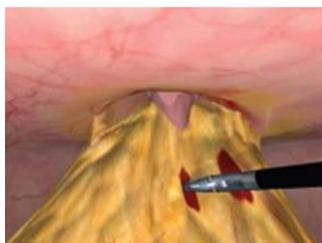
Case 2 - Periumbilical Incisional Hernia

Medical History:

A 59 year old male presented with a periumbilical incisional hernia, following previous upper median laparotomy for duodenal ulcer. On physical examination, there was an irreducible and painless bulging of the anterior abdominal wall at the level of the umbilicus.

Pathology:

Periumbilical incisional hernia where the hernia content is incarcerated inside the defect and adhesions are attaching the omentum to the abdominal wall.



Case 3 - Subumbilical Incisional Hernia

Medical History:

A 71-year-old woman developed an incisional hernia following a previous surgery for sigmoid colon resection. Physical examination revealed an irreducible and painful mass in subumbilical region.

Pathology:

Subumbilical incisional hernia where the small bowel is firmly attached to the hernia defect.



Case 4 - Epigastrium Incisional Hernia

Medical History:

A 50-year-old woman with a history of abdominal operations for small bowel obstruction, about three years prior to admission. Physical examination revealed an irreducible bulge within the upper laparotomy scar in the epigastrium. CT-scan showed small bowel loops herniated through the defect of the anterior abdominal wall in the area corresponding to clinical finding of an incisional hernia.

Pathology:

Epigastrium incisional hernia where the small bowel loops through the defect of the anterior abdominal wall.



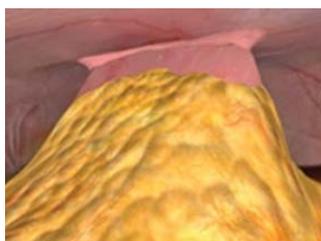
Case 5 - Incisional Hernia At the Site of Post Colostomy Scar

Medical History:

A 72-year-old man was admitted with a tender and reducible bulging located several centimeters inferior to a left lumbar scar caused by a previous open 'post colostomy'. An abdominal CT scan showed herniation of omentum through a defect in the abdominal wall near the site of the scar.

Pathology:

Incisional hernia at the site of post colostomy scar where a large amount of adhesions are attaching the omentum to the abdominal wall.



Case 6 - Incisional Hernia - Site of an Appendectomy Scar

Medical History:

A 61-year-old man was admitted with an incisional hernia at the site of an appendectomy scar, which was formed 6 years prior to admission. During the physical examination a painful, but reducible bulge was palpable, without symptoms of intestinal obstruction.

Pathology:

Incisional hernia at the site of an appendectomy scar where the colon is firmly attached to the abdominal wall.

Suggested Reading

1. **Comparison of Fresh Frozen Human Cadaver; High Fidelity Virtual Reality Simulator (LAP Mentor™, Symbionix) and Box Trainer as Methods of Training in Laparoscopic Incisional Hernia Repair.** M Sharma, Alan Horgan. Newcastle Surgical Training Centre, Freeman Hospital NHS Trust, Newcastle upon Tyne, Tyne and Wear, UK. *The abstract was presented at the 2011 Association of Laparoscopic Surgeons meeting, Nov 17-18 Cardiff, UK.*

Module 2 - Open colon Resection, Lap Right Colon Resection

2.1 Right Colectomy and Total Colectomy Supplemental Videos

Description

This collection of videos by Dr. George Crawford of the Crawford Clinic in Anniston, AL demonstrates the steps for laparoscopic management of an incarcerated ventral hernia.

Right Colectomy Video

1. Mobilize Right Colon to Hepatic Flexure
 - a. Look for the juncture of the small bowel and right colon
 - b. Could be done by first locating the appendix
 - c. Secum should be immobilized using an energy device
 - d. Mesentery of right colon should be mobilized
 - e. In this step, identify the key structures that need to be protected like the ureter
 - f. Mobilization should occur up to the hepatic flexure and to the edge of the liver
2. Transection of Transverse Colon
 - a. Omentum is mobilized off of the transverse colon.
 - b. Transection of transverse colon with GI stapler
 - c. Begin dissection of mesentery
 - i. Remaining transverse colon should be transected with scissors
3. Mobilization of Transverse Colon to Hepatic Flexure
 - a. Step is completed with an energy device
 - b. Primary objective is to lengthen the mesentery so that it can be transected safely away from the small bowel
 - c. The most challenging is identification and dissection of transverse colon from duodenum
 - d. Smaller vessel sites are often at risk to bleed and should be handled with energy device
4. Transection of Small Bowel to Right Colon
 - a. Step performed with a GI Stapler
5. Transection of Blood Supply to Right Colon
 - a. Ligate mesentery and iliosecal artery to right colon and secum
 - b. This is often a site of bleeding so it should be handled carefully
6. Transverse Colon Small Bowel Anastomosis
 - a. Determine location of transverse to small bowel anastomosis
 - b. Complete a stitch to line up the small bowel and colon to prepare for GI stapling device
 - c. Perform enterotomy in colon followed by the small bowel, then the stapler is placed inside and fired to create a side to side anastomosis
 - i. This anastomosis can be stapled or hand sewn dependent on conditions of the patient
 - d. Main objective of the step is to minimize the risk of an anastomotic leak
7. Removal of Right Colon
 - a. Requires lengthening of 10-12 trocar
 - b. Right Colon specimen is removed
 - c. Utilize a wound protector to reduce the risk of infection at incision site and allow for maximum retraction

Total Colectomy Video

Total Colectomy Notes

1. Identification and Transection of Rectosigmoid Junction
 - a. Step begins at rectosigmoid junction
 - b. Determine where the tinea will be infused so we can transect at this junction
2. Mobilization and transection of sigmoid mesentery
 - a. Mesentery is close to the lumen of the colon
3. Mobilization and Transection of Left Colon Mesentery
 - a. Mobilize up to splenic flexure away from the sidewall
 - b. The mesentery is transect so that patient position does not have to be changed and maximum hemostasis can be maintained through identification of the vessels
4. Splenic Flexure Mobilization
 - a. This continues dissection from the middle of the transverse colon over to the splenic flexure.
 - b. The colon is retracted medially to identify the small perforations and adhesions to the splenic flexure
5. Entering the Lesser Sac
 - a. Dissection continued from middle of transverse colon over to the splenic flexure
 - b. The omentum is left in place to prevent adhesions of small bowel to the abdominal wall once the colon is removed
 - c. The colon is retracted superiorly and laterally
 - d. Final step is separating the colon and omentum
6. Switching positions to mobilize the right transverse colon
 - a. Note that for this procedure, trocars are placed along the midline such that the transverse colon can be mobilized from one side of the abdomen
 - b. Patient rotated in order to move from right to left side in order to continue dissection of the remaining transverse colon and terminal ileum
 - c. Mobilize as much of the lesser sac as possible to allow for better retraction and improved view
7. Mobilize Terminal Ileum
 - a. Start at the right lower quadrant and identify the appendix
 - b. Mobilize the right colon away from the abdominal sidewall
 - c. Mobilize the small intestine
 - d. Step begins high on the abdominal wall in order to prevent ureter injury
 - e. Following mobilization of the secum, the small intestine is transected using a GI stapler
 - f. Mesentery of small intestine is transected to area where ileocecal artery is found so it can be ligated
8. Placement of Small Bowel Anastomosis Anvil
 - a. Using a babcock, the end of the small intestine is brought out at the ileocecal valve
 - b. With general retraction, the specimen is removed completely
 - i. Wound retractor is used for this step
 - c. The small bowel is connected to the rectum with a stapler
 - d. Note that the mesentery of the small bowel lay in a position so that it does not compromise the blood supply

Module 3 - Laparoscopic Sigmoid Resection

3.1 Sigmoidectomy Supplemental Videos

Description

This collection of videos by Dr. George Crawford of the Crawford Clinic in Anniston, AL demonstrates the steps of laparoscopic sigmoid colectomy.

1. Introduction
 - a. Procedure performed for a case of diverticulitis
 - b. This patient has had multiple abscesses and emissions which call for a laparoscopic sigmoidectomy
2. Mobilize Left Colon and Splenic Flexure
 - a. The left colon is mobilized away from the abdominal sidewall
 - b. This allows the surgeon to protect the retroperitoneal structures
 - c. Process is carried out all of the way to the splenic flexure
 - d. Adhesion that is close to the splenic flexure is associated with inflammation and natural attachments
3. Mobilization of the Sigmoid
 - a. Step allows access to the peritoneal reflection
4. ID of Ureter and Transection of Rectosigmoid Junction
 - a. GI Stapler is used across the lumen of the colon and dissection is begun into the mesentery of the sigmoid colon
5. Transection of Blood Supply of Sigmoid
 - a. Inferior mesentery artery is ligated 2 or 3 times depending on inflammation
6. Placement of Anvil and Removal of Sigmoid
 - a. Removal of specimen through incision above umbilicus
 - b. Wound protector used to protect from infection and improve retraction
 - c. Anvil for stapler is placed in the lumen of the left colon and sewn into place
7. Left Colon to Rectal Anastomosis
 - a. EEA stapler through rectum to junction
 - b. Anvil is secured to the stapling device
 - c. This process allows for more predictable outcomes from the procedure

3.2 Hands-on Laparoscopic Sigmoidectomy

Description

The module provides an environment in which to perform a wide range of tasks from vessel isolation through creation of the anastomosis before encountering them in the operating room. Trainees learn to determine the best approach to the procedure, practicing real-time clinical decision-making and working safely to prevent complications and respond to injuries. An anatomical 3D map, on-demand real-life videos, procedural instructions and trocar placements complete this exceptional training module.

Objectives

- ◆ To perform the peritoneal incision, while elevating the inferior mesenteric pedicle.
- ◆ To identify the left ureter.
- ◆ To perform dissection in correct tissue planes.
- ◆ To expose and divide the inferior mesenteric artery, inferior mesenteric vein, and left colic artery.
- ◆ To mobilize the sigmoid colon and perform rectal wall exposure.
- ◆ To perform a safe distal division of the sigmoid colon.
- ◆ To work with a circular stapler to perform laparoscopic end-to-end anastomosis.
- ◆ To learn to appreciate and avoid potential complications.

Specialties

General Surgery
Colon & Rectal Surgery

Target Audience

Practicing surgeons as well as the residents/fellows interested in hands-on simulation-based training for the advanced laparoscopic sigmoidectomy procedure.

Assumptions

Familiarity with basic laparoscopic skills

Suggested Time Length

Suitable for training in 2 day courses- 4 hour hands-on training per day.

Authors

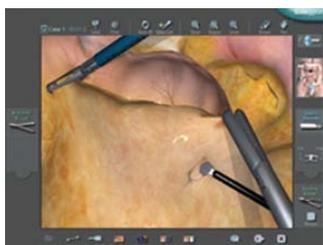
The cases were created in collaboration with:

Dr. Amir Szold, Department of Surgery, Tel Aviv Sorasky Medical Center, Tel Aviv.

Masahiko Watanabe, M.D., Ph.D., Professor & Chairman, Department of Surgery, Kitasato University School of Medicine.

Yukihito Kokuba, M.D., Ph.D., Associate Professor, Department of Laparoscopic Surgery for Digestive Disease, Kyoto Prefectural University.

Conor P Delaney M.D., MCh, PhD, FRCSI, FACS Professor of Surgery, Case Western Reserve University, Chief, Division of Colorectal Surgery, Vice-Chairman, Department of Surgery, Director, Institute for Surgery and Innovation, University Hospitals of Cleveland, Case Medical Center.

3.2.1 Hands-on Laparoscopic Sigmoidectomy**Sigmoidectomy Case 1 – Medial Peritoneal Incision to Distal Division****Medical History:**

An 81-year-old man reports new onset constipation and lower abdominal discomfort that began four weeks prior to admission to your hospital. A diagnostic work-up, including colonoscopy, was performed elsewhere. The test revealed a space-occupying lesion in the sigmoid colon. Examination of biopsy specimens taken from the sigmoid tumor by colonoscopy disclosed fragments of moderately differentiated adenocarcinoma. A CT scan revealed a small tumor in the sigmoid colon and no evidence of metastases. The patient was scheduled for laparoscopic-assisted sigmoidectomy.



Sigmoidectomy Case 2 - Anastomosis

Pathology:

The sigmoid has been removed by laparoscopic sigmoidectomy. The colon has been exteriorized, prepared for anastomosis, and placed back into the abdomen. The anvil of a circular stapler has been inserted. The minilaparotomy has been closed and pneumoperitoneum reestablished.

Main Goals:

Perform end-to-end anastomosis between the distal and proximal stumps using the circular stapling device.

Coming Soon:

Module 4 - Open Right Colon Resection

Module 5 - Laparoscopic/Open Bile Duct Exploration

Module 6 - Laparoscopic Ventral/Incisional Hernia Repair (Porcine Model)

Module 7 - Laparoscopic Appendectomy

7.1 Hands-on Laparoscopic Appendectomy

Description

Acquire skills and knowledge of key components of the Appendectomy procedure: Exposure of the appendix; division of the mesoappendix and appendix; specimen retrieval and control of hemostasis.

Practice a variety of techniques and appropriate use of surgical instruments.

Educational Aids: An anatomical 3D map, real-life videos, interactive 3D guidance and comprehensive objective performance metrics.

Learning Objectives:

- ◆ To perform proper manipulation of the appendix while avoiding unnecessary trauma.
- ◆ To safely transect the appendicular artery using different instruments.
- ◆ To conduct hemostatic dissection of the mesoappendix.
- ◆ To practice different methods of the appendix division.
- ◆ To retrieve the specimen using an endobag removal device.
- ◆ To learn how to avoid and manage potential complications.
- ◆ To perform an inspection of the operating site for adequate hemostasis.

Specialties

General Surgery

Target Audience

Practicing surgeons as well as the residents/fellows interested in laparoscopic appendectomy procedure training and in becoming familiar with the instruments and techniques for performing this procedure.

Assumptions

Familiarity with basic laparoscopic skills

Suggested Time Length

Suitable for training in 2 day courses- 4 hour hands-on training per day.

Authors

The cases were created in collaboration with:

Emile Rijcken, MD, Staff Surgeon, Department of General and Visceral Surgery, Muenster University Hospital, Germany.

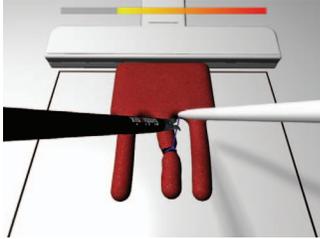
Jeffrey M. Marks, MD, FACS, FASGE, Professor of Surgery, Director of Surgical Endoscopy, Program Director, Case Surgery University Hospitals, Case Medical Center, Cleveland, Ohio

Amir Szold, MD, Medical Director, Assia Medical Group, Assuta Hospital, Tel Aviv, Israel.

7.1.1 Hands-on Laparoscopic Appendectomy

Instructions

Perform the placement of ligating loop task to the required level of skill, and continue to experience a full appendectomy simulated procedure case.



Essential Skills Task 3 – Placement of Ligating Loop

Task Description:

Placement the ligating loop around a foam appendage on the provided mark as accurately as possible.

Benchmarks to be achieved concurrently within one task repetition:

* Taken from Laparoscopic Surgical Skills (LSS) Course – Grade 1 Level 1

Insecure knot - No

Accuracy error – Outside of 1 mm - No

Total time - ≤ 0:53



Case 1 - Laparoscopic Appendectomy

Suggested Reading

1. **Construct validity of endoloop task on LAP Mentor™; a high fidelity, virtual reality laparoscopic surgical simulator.** M. Sharma*, A. Horgan. Newcastle Surgical Training Centre, Freeman Hospital NHS trust, Newcastle Upon Tyne, UK. *The abstract was presented at the International Surgical Congress of the Association of Surgeons of Great Britain and Ireland, May 9-11 2012, Liverpool, UK.*
2. **Laparoscopic Surgical Skills (LSS) Curriculum – Grade 1 Level 1.** Laparoscopic Surgical Skills Foundation. Website: www.LSS-surgical.eu

Coming Soon:

Module 8 - Laparoscopic Nissen Fundoplication

Module 9 - Sentinel Node Biopsy & Axillary Lymph Node Dissection

Module 10 - Open Inguinal/Femoral Hernia Repair

Module 11 - Laparoscopic Inguinal Hernia Repair

Module 12 - Laparoscopic/Open Splenectomy

Module 13 - Laparoscopic/Open Cholecystectomy

13.1 Laparoscopic Cholecystectomy Procedural Tasks

Description

4 didactic tasks provide a step-by-step tutorial of the Lap Chole procedure. Each task focuses on one critical step of the procedure: Achieving the critical view of the cystic duct and artery, safe clipping and cutting and dissection of gallbladder from the liver bed. Instructions on safe procedure performance are applied to the anatomical setting. This module helps surgeons identify the visual cues associated with traction/counter-traction of tissue as well as identifying areas requiring additional practice.

Learning Objectives

- ◆ To become familiar with the anatomy of the gallbladder area.
- ◆ To learn the principles of safe and accurate clipping and cutting based on correct traction of the gallbladder.
- ◆ To expose Calot's Triangle by practicing correct gallbladder traction for secure and accurate clipping and cutting.
- ◆ To perform safe exposure of vital structures using correct traction.
- ◆ To gain knowledge of the principles of safe dissection and safe cautery in laparoscopic cholecystectomy.
- ◆ To perform safe and accurate dissection of the gallbladder from the liver bed, by applying the principles of correct traction.
- ◆ To become accustomed to laparoscopic instruments.

Specialties

General Surgery

Target Audience

Practicing surgeons as well as residents/fellows interested in step-by-step training of laparoscopic cholecystectomy.

Suggested Time Length

Suitable for training in 2 day courses- 4 hour hands-on training per day.

Authors

The cases were created in collaboration with:

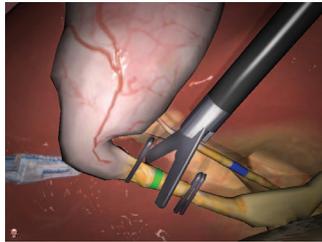
Dr. Jeffrey Ponsky, Chairman, Department of Surgery, University Hospitals of Cleveland.

Dr. Amir Szold, Department of Surgery, Tel Aviv Sorasky Medical Center, Tel Aviv.

13.1.1 Laparoscopic Cholecystectomy Procedural Tasks – Training

Instructions:

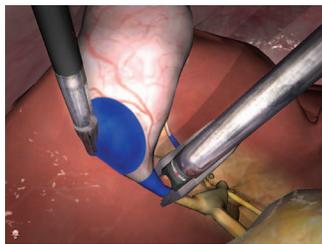
Performed for a maximum of two sessions per day, with a break of more than one hour between each session.



Task 1 - Clipping and Cutting - Retracted Gallbladder

Task Description:

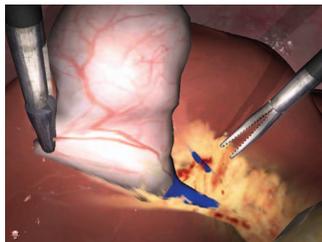
Gallbladder already exposed with Hartmann's pouch retracted by a static tool. Clip the cystic artery and duct within a specified area and then cut safely between the clips.



Task 2 - Clipping and Cutting Using Two Hands

Task Description:

With the gallbladder already exposed use a blunt grasper to retract Hartmann's pouch. Once correct retraction is achieved, clip the cystic artery and duct within a specified area and then cut safely between the clips.



Task 3 - Dissection - Achieving the 'Critical View'

Task Description:

Grasp the infundibulum of the gallbladder, retract away from the liver, and dissect the peritoneal coverings to expose the cystic duct and artery.



Task 4 - Gallbladder Separation

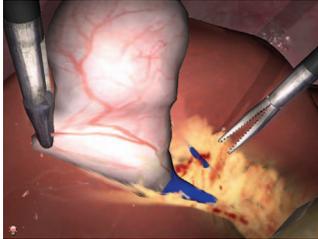
Task Description:

With the gallbladder already exposed use a blunt grasper to retract Hartmann's pouch. Once correct retraction is achieved, clip the cystic artery and duct within a specified area and then cut safely between the clips.

13.1.2 Laparoscopic Cholecystectomy Two Procedural Tasks - Proficiency

Instructions:

Performed for a maximum of two sessions per day, with a break of more than one hour between each session. Completion of training when all of the following levels of skill are achieved on two consecutive sessions.



Task 3 - Dissection - Achieving the 'Critical View'

Task Description:

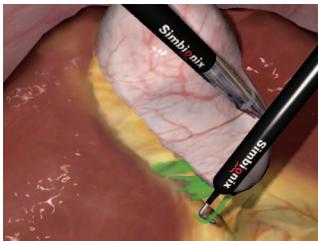
Grasp the infundibulum of the gallbladder, retract away from the liver, and dissect the peritoneal coverings to expose the cystic duct and artery.

Required Skill Level:

Total time taken < 280 s

Total number of movements < 240

Total cautery time < 15 s



Task 4 - Gallbladder Separation

Task Description:

Separate the gallbladder from the liver bed with appropriate retraction and dissection of the peritoneal adhesions to the liver bed. Continue dissection until the gallbladder is free from the liver.

Required Skill Level:

Total time taken < 300 s

Total number of movements < 275

Total path length < 500 cm

13.2 Laparoscopic Cholecystectomy Complete Procedure

Description

6 simulation tasks, each with 3 anatomical variations, provide 18 complete Lap Chole procedure cases. The realistic Lap Chole procedure simulation resembles a true-to life experience, enhanced even more by tactile feedback. The module provides patient cases of easy to difficult anatomical variations to the cystic duct and positions of arteries, which may otherwise not be experienced during a training period. The module enables free-style training using different techniques, alternative approaches, and acquisition of the skill and knowledge necessary to safely cope with possible complications.

Learning Objectives

- ◆ To become familiar with the anatomy of the gallbladder area.
- ◆ To become proficient at performing a safe laparoscopic cholecystectomy.
- ◆ To familiarize with the pitfalls of easy to difficult anatomical variations to the cystic duct and positions of arteries.

Specialties

General Surgery

Target Audience

Practicing surgeons as well as the residents/fellows interested in a whole-procedure VR training for laparoscopic cholecystectomy.

Assumptions

Familiarity with basic laparoscopic skills

Suggested Time Length

Suitable for training in 2 day courses- 4 hour hands-on training per day.

Authors

The cases were created in collaboration with:

Dr. Jeffrey Ponsky, Chairman, Department of Surgery, University Hospitals of Cleveland .

Dr. Amir Szold, Department of Surgery, Tel Aviv Sorasky Medical Center, Tel Aviv.

13.2.1 Laparoscopic Cholecystectomy Complete Procedure – Proficiency

Instructions:

Performed for a maximum of two sessions per day, with a break of more than one hour between each session. Completion of training when all of the following levels of skill are achieved in two consecutive sessions.



Case 1 - Laparoscopic Cholecystectomy

Task Description:

Virtual complete cholecystectomy procedures, based on anatomies created from CT/MRI real patient data. Practice a complete cholecystectomy procedure with a range of appropriate instruments.

Required Skill Level:

Total time taken < 540 s

Total number of movements < 480

Total path length < 1000 cm

13.2.2 Laparoscopic Cholecystectomy Complete Procedure – Additional Training



Laparoscopic Cholecystectomy Case 1 – 6

Task Description:

Virtual complete cholecystectomy procedures, based on anatomies created from CT/MRI real patient data. Practice a complete cholecystectomy procedure with a range of appropriate instruments.

The required skill level for the basic skills is based on Development of a virtual reality training curriculum for laparoscopic cholecystectomy (Darzi et al. British Journal of Surgery 2009; 96: 1086–1093).

Suggested Reading

1. **Development of a virtual reality training curriculum for laparoscopic cholecystectomy.** R. Aggarwal, P. Crochet, A. Dias, A. Misra, P. Ziprin and A. Darzi Department of Biosurgery and Surgical Technology, St Mary's Campus, Imperial College Healthcare NHS Trust, London W2 1NY, UK. *British Journal of Surgery* 2009; 96: 1086–1093
2. **A Simulation Assessment Tool For Operative Laparoscopic Skill Advancement of Residents (SOLAR): A Global Study.** A Aggarwal, K Miles, A Currie, D Defriend; B Fernando, B Hobbs, D Lomanto, B Patel, A Renwick, A Darzi Imperial College, London, UK. *The abstract was presented at the Annual Meeting of the ACS Accredited Educational Institutes Consortium, April 29-30, 2011, Chicago, Illinois.*
3. **Preoperative Warm-Up Using a Virtual Reality Simulator.** Radu Moldovanu, MD, PhD, Eugen Târcoveanu, MD, PhD, Gabriel Dimofte, MD, PhD, Cristian Lupaşcu, MD, PhD, and Costel Bradea, MD, PhD First Surgical Unit, "St. Spiridon" Hospital Iaşi, University of Medicine and Pharmacy "Gr.T. Popa" Iaşi, Romania. *JSL. 2011 Oct-Dec; 15(4): 533–538.*
4. **Basic Laparoscopic Training Using the Symbionix LAP Mentor: Setting the Standards in the Novice.** Martin W. von Websky, MD. Martina Vitz, Dr., Dimitri A. Raptis, MD, R. Rosenthal, MD, P.A. Clavien, MD. Dieter Hahnloser, MD. Department of Visceral Surgery, University Hospital of Zurich, Zurich, Switzerland; Laparoscopic Training Center, Zurich, Switzerland. *Journal of Surgical Education published online 06 February 2012.*
5. **Criterion-based laparoscopic training reduces total training time.** Wilson MR, Wilson MR, Brinkman WM, Buzink SN, Alevizos L, de Hingh IH, Jakimowicz JJ. Department of Surgery, Catharina Hospital Eindhoven, Michelangelolaan 2, 5623 EJ, Eindhoven, The Netherlands. *Surg Endosc.* 2011 Nov 1.
6. **Impact of laparoscopy simulator training on the technical skills of future surgeons in the operating room: a prospective study.** Beyer L, Troyer JD, Mancini J, Bladou F, Berdah SV, Karsenty G. CERC (Centre d'Enseignement et de Recherche Chirurgicale) Faculté de Médecine de Marseille Secteur Nord, Université de la Méditerranée, Boulevard Pierre Dramard, 13916 Marseille, France. *Am J Surg.* 2011 Sep;202(3):265-72.
7. **Laparoscopic Surgical Skills (LSS) Curriculum – Grade 1 Level 1.** Laparoscopic Surgical Skills Foundation. Website: www.LSS-surgical.eu
8. LAP Mentor validations: <http://symbionix.com/simulators/clinical-validations/lap-mentor/>

Module 14 - Gastric Resection & Peptic Ulcer Disease

14.1 Gastric Bypass Supplemental Videos

Description

This collection of videos takes the learner through the steps of a Roux-En-Y gastric bypass by Philippe Topart, MD. Clinique de l'Anjou, Angers, France. (SAGES, ASBMS)

1. Introduction and Division of Upper and Short Gastric Vessels
 - a. Procedure begins following setup in the French Position with 7 trocars
 - b. Objective is to form a gastric pouch as small as possible to ensure weight loss
 - i. Pouch should be between 3 and 4 cm wide and 5 and 6 cm long
 - ii. Should be fashioned with 1 Transversal and 1 Longitudinal linear stapler/cutter
 - c. Procedure begins with the division of the upper short gastric vessels so that the gastric fundus can be mobilized
2. Dissection along the Left Crus of Diaphragm
 - a. Care must be taken to fully dissect along the left crus of the diaphragm and to divide the left portion of the peritoneum and fat that cover the esophagogastric junction
 - b. Allows for the reduction of a potential hiatal hernia and gives full exposure of the angle of His where the stapling is going to be applied. This part of the procedure roughly mimics the surgical steps of a fundoplication for GERD.
3. Incision of Lesser Curvature of Stomach and Introduction of Linear Stapler
 - a. The lesser curvature of the stomach is incised (<1") at the level or just below the 1st branch of the left gastric artery
 - b. A tunnel is thus created behind the gastric wall. Although this is preferable, it is not necessary to have the forceps go all the way to the freed area on the greater curvature
4. Introduction of Longitudinal Stapler
 - a. Sufficient length of retrogastric tunnel is however necessary to ensure safe introduction of the linear stapler/cutter
 - b. The 60 mm linear stapler/cutter is first applied transversally (coming from the RUQ port) after the nasogastric tube has been removed from the stomach
5. Division of Greater Omentum
 - a. This step is not necessary in every case
6. Measurement of Bowel Limb
 - a. We use a 100 cm biliopancreatic limb (longer than usually found in gastric bypass with no specific reason) and a more standard 150 cm alimentary limb.
 - b. Measurement is done using a 50 cm tape
7. Division of Jejunum and Application of Marking Clips
 - a. The jejunum is divided 100 cm distally from the angle of Treitz
 - b. Marking clips are placed 150 cm distal from the division of the bowel
8. Gastrojejunal Anastomosis
 - a. It is done in a side to side fashion antecolic, antegastric
 - b. An opening is made on the small bowel as well as on the gastric staple line
9. Calibrate Anastomosis
 - a. jaws of the linear stapler/cutter are inserted in the openings trying to position the stapler at the 30 mm mark
 - b. This is our way to "calibrate" the anastomosis.
10. Running Suture along Anterior Aspect of Anastomosis
 - a. The running suture of the anterior aspect of the anastomosis uses a 2/0 absorbable thread with securing absorbable clips
11. Anchoring Sutures at Ends of GJ
 - a. Anchoring sutures at both ends of the GJ can help exposure

12. Nasogastric Tube Removal

- a. The nasogastric tube is definitively removed after the methylene blue test, the linear stapler/cutter being used as a clamp on the alimentary limb

13. Jejunojejunal Anastomosis

- a. Is done the same way as the GJ but using 2 layers and after locating the marking clips on the alimentary limb. The mesenteric defects are usually closed with a non-absorbable 2/0 running suture with securing clips or with a non-absorbable wound closure device.

14.2 Gastric Bypass Simulator Training

Description

4 key steps for performing laparoscopic gastric bypass. Provides surgeons with the opportunity to perform advanced tasks including creation of the gastric pouch, measurement and division of the jejunum, gastrojejunal anastomosis and enteroenterostomy anastomosis. Trainees practice the technical aspects of laparoscopic Roux-en-Y creation and jejunojejunostomy and gain an in-depth understanding of intra-operative problems during lap bypass surgery and how to avoid them. Familiarity with instruments is gained by experience with a variety of procedure specific surgical instruments, while instructional movies enhance knowledge of the procedure.

Learning Objectives

- ◆ To practice creating the gastric pouch in a simulated anatomy.
- ◆ To learn the principles and techniques of measuring and dividing the jejunum into duodenojejunal limb and gastrojejunal limb.
- ◆ To perform gastrojejunal anastomosis.
- ◆ To perform enteroenterostomy anastomosis (2 Anatomical Positions).

Specialties

General Surgery

Bariatric Surgery

Target Audience

Practicing surgeons as well as the residents/fellows interested in familiarizing with the instruments and techniques for performing the gastric bypass procedure.

Assumptions

Familiarity with basic laparoscopic skills

Suggested Time Length

Suitable for training in 2 day courses- 4 hour hands-on training per day.

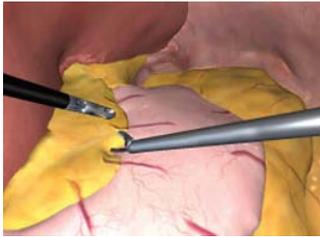
Authors

The cases were created in collaboration with:

David Nocca, MD, Faculty of medicine of Montpellier. University hospital of Montpellier, FRANCE.

Raul J. Rosenthal MD FACS, Assistant Professor of Surgery, Ohio State School of Medicine. Medical Director of the Bariatric Institute and Section Head of Minimally Invasive Surgery, Cleveland Clinic Florida.

14.2.1 Gastric Bypass Simulator Training



Gastric Bypass - Case 1: Creating the Gastric Pouch

Task Description:

The case starts with the liver already retracted cephalad.

The patient's BMI is 40.

Create a gastric pouch as follows:

- ◆ Select your preferred trocar configuration from the Trocar Config menu.
- ◆ Expose the left crus of the diaphragm at the level of the angle of Hiss to mark the subsequent cutting direction of the linear cutter.
- ◆ Identify the third vessel at the lesser curvature of the stomach to initiate dissection.
- ◆ Create an opening at the lesser omentum close to the stomach between the second and third vessel, and continue the dissection posteriorly to enter the retrogastric space.
- ◆ Introduce the linear cutter and cut the stomach horizontally.
- ◆ Reload the linear cutter and introduce it again to cut the stomach vertically towards the left crus of the diaphragm.
- ◆ Fire the linear cutter repeatedly until the gastric pouch is disconnected from the rest of the stomach.
- ◆ Make sure that you do not include the fundus in the pouch and do not cut the esophagus.



Gastric Bypass - Case 2: Measuring and Dividing the Jejunum

Task Description:

Measuring and dividing the jejunum into duodenojejunal limb and gastrojejunal limb.

The case starts with the greater omentum and the transverse mesocolon already retracted cephalad.

The patient's BMI is 40.

Divide the jejunum as follows:

- ◆ Select your preferred trocar configuration from the Trocar Config menu.
- ◆ Identify the ligament of Treitz at the base of the transverse mesocolon.
- ◆ Measure the jejunum starting from the ligament of Treitz; 40 cm for the duodenojejunal limb and an additional 100 cm for the gastrojejunal limb.
- ◆ Divide the jejunum using the linear cutter at a distance of 40 cm from the ligament of Treitz.
- ◆ Make sure you identify the duodenojejunal limb by tracing it back to the ligament of Treitz.

- ◆ Mark the duodenojejunal limb by placing a clip on the staple line using the clip applicator.
- ◆ Measure the length of the gastrojejunal limb starting from the point of jejunal division.



Gastric Bypass - Case 3: Gastrojejunal Anastomosis

Task Description:

The case starts after the division of the jejunum and the stabilization of the gastrojejunal limb next to the gastric pouch. The gastrojejunal limb is represented by a short segment of the jejunum.

Perform the gastrojejunal anastomosis as follows:

- ◆ Select your preferred trocar configuration from the Trocar Config menu.
- ◆ Use the harmonic scalpel to create an incision in the gastrojejunal limb at a safe distance from the staple line at the end of the limb. Create a second incision in the gastric pouch.
- ◆ Insert the linear cutter through both incisions and perform the gastrojejunal anastomosis.
- ◆ Click finish to view a video that shows how to close the opening remaining from linear-cutter anastomosis with a continuous suture.



Gastric Bypass - Case 4: Enteroenterostomy Anastomosis

Task Description:

The case begins with the possibility of choosing between anatomical positions A or B. In A, the stump of the duodenojejunal limb is proximal, in B, distal.

The jejunum has been divided and the duodenojejunal limb, stabilized next to the distal part of the gastrojejunal limb.

Each limb is represented by a short segment of the jejunum.

Perform the enteroenterostomy as follows:

- ◆ Select your preferred trocar configuration from the Trocar Config menu.
- ◆ Create an incision in the duodenojejunal limb at a safe distance from the staple line using the harmonic scalpel.
- ◆ Create a second incision in the gastrojejunal limb.
- ◆ Insert the linear cutter through both incisions and perform the enteroenterostomy.
- ◆ For position A: If you choose to use the linear cutter to close the opening left by linear-cutter anastomosis, use the linear cutter again to enlarge the passage between the anastomosed limbs. This will prevent future stenosis. Alternatively, click 'finish' to view a video that shows how to close the opening with a continuous suture.
- ◆ For position B: Click 'finish' to view a video that shows how to close the opening with a continuous suture.

Suggested Reading

1. **Can virtual reality simulation be used for advanced bariatric surgical training?** Lewis TM, Aggarwal R, Kwasnicki RM, Rajaretnam N, Moorthy K, Ahmed A, Darzi A. Department of Cancer and Surgery, St. Marys Hospital, Imperial College London, London, UK. *Surgery*. 2012 Jun;151(6):779-84
2. **SORTED (Surgery for Obesity – Registrar Training and Educational Development) Bariatric Course.** <http://symbionix.com/training-management/curricula-2/lap-mentor-curricula/>

Coming Soon:

Module 15 - Parathyroidectomy/Thyroidectomy