A novel permanent therapy for esophageal achalasia: Peroral endoscopic myotomy (POEM)

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Achalasia is a long-lasting disease with typical symptoms: swallowing difficulty and chest pain. So far, medical treatments such as balloon dilatation and Botox injection are mainly applied, but their efficacy is just limited to the short term.

Laparoscopic myotomy has been performed as a standard procedure of choice expecting permanent cure. But in laparoscopic surgery, myotomy length is still limited and it usually demands at least five abdominal incisions to accomplish it.

We clinically developed a brand-new less invasive procedure of POEM (peroral endoscopic myotomy) in 2008 at Showa University Northern Yokohama Hospital [1-2].

Haruhiro Inoue, MD interviewed by Silvana Perretta
POEM requires no skin incision to perform myotomy completely. POEM is expected to offer total recovery from dysphagia and dramatic relief from chest pain due to esophageal spasm. Eighty-seven consecutive cases have been treated with POEM so far (Feb 28, 2011). Any major complications that may occur (hematoma, mediastinal abscess, prolonged hospital stay, etc.) did not happen. Average hospital stay was 4.2 days. Resting pressure decreased from 31.2 mmHg to 12.5 mmHg on average. The Eckardt score was dramatically improved from 4.9 to 0.5 on average. Eighty-seven cases included 25 cases of sigmoid-type achalasia. POEM was effective for those cases. Five surgically failed patients received POEM. Symptom score was significantly improved. We consider that POEM is effective in all stages of achalasia patients, and it may replace laparoscopic surgery for the treatment of esophageal achalasia.

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1.2. Transoral endoscopic inner layer esophagectomy

Esophageal resection is an accepted treatment for Barrett’s esophagus with high-grade dysplasia and superficial invasive malignancy [1-2]. However, despite its effectiveness in providing definitive and curative treatment, esophagectomy is associated with substantial morbidity [3-5].

As such, there has been a drive towards attempting esophageal preservation in patients with intramucosal neoplastic lesions in which lymphatic involvement is unlikely [6-7]. The early success of recently introduced endoscopic approaches such as endoscopic resection and radiofrequency ablation has resulted in a demand for definitive treatments, which ultimately preserve the esophagus. The limitation of these techniques resides in an incomplete and inconsistent histological assessment of the affected luminal surface area. As such, patients require life-long
1.2. Transoral endoscopic inner layer esophagectomy

Biologic scaffolds composed of xenogeneic extracellular matrix have been evaluated for their ability to facilitate non-inflammatory and normal tissue healing response in numerous anatomical sites, including the esophagus [17-18]. In pre-clinical work, circumferential defects were repaired with minimal stricture formation and near normal restitution of the esophageal histomorphology (if host muscle was placed in contact to the ECM) [19].

The work presented herein highlights our approach to en bloc sleeve resection of the mucosa-submucosa complex over the entire length of the diseased esophagus, while preventing stricture formation with the co-localization of porcine bladder-derived extracellular matrix in the remaining muscularis propria tube. We present the rationale and technique development of transoral endoscopic esophagectomy and discuss the translation of this technique into humans.

surveillance and subsequent interventions for undetected synchronous or metachronous lesions [9-10]. While endoscopic submucosal dissection can provide an en bloc R0 resection, this technique is operator-dependent, limited by existing technology, cannot address circumferential disease and has a high risk of perforation [11-13]. With all endoscopic techniques, there is a risk for stricture formation if ablation or resection depth enters into the submucosal layer or is extremely large (>3cm) [14-16].
1.2. Transoral endoscopic inner layer esophagectomy

**PORCINE MODEL**

- Proximal entry
- Mucosal stripping
- ESD collar
- Distal mucosal amputation
- Preparation for stripping
- Final result

**HUMAN PROCEDURE**

- Distal target ESD
- Secure and Skin
- Inject hyaluronate Proximal cuff
- ECM Placement
- ESD tunnel
- Follow-up endoscopy
1.2. Transoral endoscopic inner layer esophagectomy

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1.2. Transoral endoscopic inner layer esophagectomy


With NOTES, complex abdominal procedures may be performed endoscopically using adapted tools. Colorectal surgery is at the forefront of this technological revolution given the central role of endoscopy. Over 20 years of published evidence on the safety of Transanal Endoscopic Microsurgery (TEM) support the notion that purposeful entry into the peritoneal cavity may be safe, granted adequate closure is achieved. This served as the basis for transanal rectosigmoid resection using TEM described in human cadavers in 2007 [1].

The feasibility of pure transanal endoscopic rectosigmoid resection using TEM was investigated in swine cadavers and acute animals [2]. The safety of this approach was subsequently evaluated in a 2-week survival study using 20 swines comparing outcomes of pure transanal versus combined transanal and transgastric
endoscopic rectosigmoid resection [3]. Transanal NOTES rectosigmoid resection with total mesorectal excision (TME) was assessed in human cadavers using the same technique and standard TEM, laparoscopic and endoscopic tools [4]. Lastly, the first transanal endoscopic resection using TEM and laparoscopic assistance was performed in a patient with a T2N2 mid-rectal cancer treated with preoperative chemoradiation [5].

In swines, circumferential en bloc resection of the rectosigmoid and its mesentery was performed using TEM followed by transanal specimen extraction and stapled colorectal anastomosis [2]. Combining transgastric and transanal endoscopic access overcame difficulties with visualization and permitted mobilization of additional colon [2-3]. In the survival study, an abdominal abscess and abdominal wall hematoma were found at necropsy in the combined group [3].

In human cadavers, full-thickness dissection of the rectum was initiated at the level of the anorectal ring. TME was completed in all cases and upon entry into the abdomen, a variable length of colon was mobilized due to limited maneuverability [4]. In the first clinical case published to-date, these limitations were overcome by laparoscopic assistance [5] and TME was achieved with an intact mesorectum, 23 negative lymph nodes and negative margins [5].

Based on extensive experimental testing, NOTES transanal endoscopic rectosigmoid resection with TME is feasible and safe, and with laparoscopic assistance, may be used for rectal cancer in selected patients. Oncologic adequacy and long-term outcomes of this procedure require formal investigation.
1.3. NOTES and rectal cancer

REFERENCES


Primary hyperparathyroidism (PHPT) is a common endocrine disorder with complications including kidney stones, osteoporosis, cardiovascular disease and an overall lower health-related quality of life. Parathyroidectomy is an effective and durable treatment for PHPT.

Multiple imaging modalities have been reported for the localization of parathyroid adenomas including ultrasonography, Tc-99m sestamibi scan, CT scan and magnetic resonance imaging. CT scanners are becoming ubiquitous in the developed world due to their versatility and low inter-operator variability, but have not proven exceptional at localization of parathyroid adenomas without enhancements such as perfusion [1-3]. 3D rendering may enhance the ability of standard CT to localize parathyroid...
1.4. Preoperative virtual neck exploration & intraoperative augmented reality for parathyroidectomy

IRCAD. Rendering begins with automated algorithms to differentiate skin, trachea, lungs, bones, blood vessels and esophagus. A radiology technician in our group then views the axial, sagittal and frontal views simultaneously. Suspicious parathyroid lesions are highlighted based on location, size, shape, Hounsfield units, visibility on at least two out of three planner images, and no correlation on any planer image with vascular or other known structures. The model is then used for a 3D preoperative neck exploration by the endocrine surgery group to finalize operative planning.

Tumor detection using preoperative virtual neck exploration has a higher sensitivity and similar specificity for parathyroid adenomas compared to ultrasound, sestamibi and standard CT scan at our center. Posterior adenomas are more easily detected in the sagittal view, whereas anterior parathyroid glands are more easily detected in the frontal view.

3D rendering provides an excellent platform for preoperative virtual neck exploration with visualization of the patient-specific anatomy. This modality allows the surgeon to envision potential lesions and predict intraoperative difficulty due to anatomical variation. In addition, the virtual neck model can be further applied during the operation with image overlay creating an augmented reality for the operating surgeon.

Patients with primary hyperparathyroidism in our center undergo neck CT with contrast injection and 0.75mm slices. From these images, 3D rendering is performed using the 3D Virtual Patient Modeling (3D VPM) and VR-Render software, both developed at IRCAD. Present 3D rendering from standard CT images to enable preoperative virtual neck exploration and intraoperative augmented reality.
1.4. Preoperative virtual neck exploration & intraoperative augmented reality for parathyroidectomy

Clinical case: Video-assisted parathyroidectomy
1.4. Preoperative virtual neck exploration & intraoperative augmented reality for parathyroidectomy

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There is only one randomised control trial (RCT) and 8 non-randomised RCTs comparing TAPP with TEP. The EU Hernia Trialists Collaboration (Br J Surg 2000:87;860-867) performed a systematic review of 34 RCTs comparing laparoscopic (TAPP and TEP) with open methods of groin hernia repair. The National Institute for Clinical Excellence (NICE) systematic review (September 2004) of 37 RCTs compared laparoscopic (TAPP and TEP) with open mesh repairs in 5560 patients. The Cochrane Collaboration in 2007 systematic review of 1 RCT and 8 non-randomised RCTs compared TAPP with TEP.
1.5. Laparoscopic hernia repair - TAPP or TEP

The RCTs of laparoscopic versus open considered the following:

- Is the technique safe?
- Is the repair secure?
- Are long-term morbidity rates better?
- Do patients return to normal activities earlier?
- Are there any additional benefits?

Safety
The EU study indicated injuries per 1000 patients were TAPP 7.3, TEP zero, Open 1.1. NICE concluded TEP and TAPP produced fewer wound infections and haematoma; vascular injuries were 0.13% in TAPP and zero in TEP and Open. Visceral injuries were TAPP 0.79%, TEP 0.16% and Open 0.14%. The conclusion was that TEP was safer than TAPP.

Security of the repair
EU trial [1] 10 RCTs recurrence rate 2% in TAPP, 2.1% in Open. In 4 RCTs of TEP versus Open mesh recurrence was 2.2% and 1.4% respectively. The overall Laparoscopic recurrence rate was
1.5. Laparoscopic hernia repair - TAPP or TEP

2.3% and Open 2.9%. The NICE study of recurrence in 15 RCTs was TAPP 2.5%, Open 2.1%. In 13 RCTs, recurrence in TEP was 2.3% and Open 1.3%. The overall conclusion of these studies was no significant difference in recurrence in TEP, TAPP or Open.

Chronic pain
Coala Trial Group [2] in 994 patients TEP 2%, Open 14% (p<0.001). NICE appraisal in 8 RCTs showed a recurrence rate (RR) of 0.72 in favour of TAPP versus Open and in 4 RCTs a RR of 0.72 for TEP compared with Open. The conclusion in all of these trials confirmed a significant reduction in chronic pain. Persistent numbness is also significantly reduced (RR 0.26) in 8 RCTs of TAPP versus Open and 4 RCTs TEP versus Open (RR 0.67) in the NICE appraisal. In 2 RCTs TAPP versus Open, the numbness reduction was maintained at 5 years [3].

Additional benefits
Bilateral herniae: Laparoscopic approach through the same 3 small incisions, the cost of an additional mesh, relatively small increase in operating time and no increase in postoperative pain or recovery; also the opportunity to repair occult contralateral herniae.

Is it cost-effective?
Re-analysis of MRC Laparoscopic Groin Hernia Trial considered that TEP and TAPP is a cost-effective alternative to open flat mesh hernia (OFM). The overall conclusion of laparoscopic versus open is that in laparoscopic repair there is less pain, quicker recovery, less chronic pain and numbness, low recurrence, fewer complications and overall cost-effectiveness to society. There is no statistical difference between TAPP and TEP in terms of length of

Return to normal activities
29 RCTs and in 25 of these reported an earlier return to normal activities or work (Sign test p<0.001). Coala Trial Group in 1997 TEP versus Open normal activities 6 days versus 10 days, work 14 days versus 21 days and athletic activities 24 days versus 36 days (p<0.001 in all groups). NICE appraisal 2004 meta-analysis of 7 RCTs TAPP versus Open RR of 0.66 in favour of TAPP (p=0.00001) and meta-analysis of 5 RCTs TEP versus Open RR of 0.49 (p=0.00001) in favour of TEP.

[Image of a hernia repair]

TEP repair, right indirect inguinal hernia
1.5. Laparoscopic hernia repair - TAPP or TEP

operation, haematoma formation, length of stay, return to usual activity or recurrence rates. However in TAPP, there is a higher incidence of port site herniae and visceral injuries.

REFERENCES


Keep abreast of changes in surgical techniques and emerging technologies to offer patients the most up-to-date procedures.

2.1. Robotic single access thyroidectomy

2.2. Video-assisted parathyroidectomy

2.3. Laparoscopic D2 gastrectomy
The axillary approach to the thyroid gland was described by Eastern authors. The objective was to avoid an undesired scar in the neck. In Western countries, although the goal is to minimize the incisions, this approach has never been developed until it has been clear that the axilla represents the only way to apply the robotic technology to the thyroid, due to the spaces required by the instruments.

The patient is positioned supine, with the arm extended upward and the head slightly hyper-extended, to obtain the shortest distance from axilla to neck. The incision is 6 to 8cm in length, on the lateral edge of the pectoralis muscle. A subcutaneous plane is followed until the two heads of the sternocleidomastoid muscles are encountered, and the space between them is opened. The

*Operative Techniques*

2.1. Robot-assisted (Da-Vinci System SiHD system) total thyroidectomy from a single axillary access (RATT)
2.1. Robot-assisted (Da-Vinci System SiHD system) total thyroidectomy from a single axillary access (RATT)

Neck is entered by dissecting the internal jugular vein, retracting it downward. The thyroid lobe is then identified, and the strap muscles dissected from it. The robotic instruments are then introduced, once the operative space has been achieved using a specific external retractor. The instruments needed are: a 30-degree camera, an ultrasonic energy device, and two Maryland forceps. The robot-assisted lobectomy starts with the dissection of the upper pedicle, and of the inferior vessels, and then ends with the identification of the inferior laryngeal nerve and the parathyroid glands. The use of the 30-degree endoscope allows to perform the contralateral lobectomy, staying very close to the thyroid lobe to identify the inferior laryngeal nerve and the parathyroid glands. Thyroidectomy can be completed by a thorough central neck dissection.

A safe and thorough RATT can be performed with two main advantages: the endoscopic magnification, which allows for an oncologically radical operation, and the absence of scar in the neck.
2.1. Robot-assisted (Da-Vinci System SiHD system) total thyroidectomy from a single axillary access (RATT)
The presence of a single parathyroid adenoma accurately located using preoperative imaging is the best indication for minimally invasive surgery when dealing with primary hyperparathyroidism. It is certainly possible to search for several glands that may be suspicious of adenoma, but an extensive experience in video-assisted cervical surgery is required to find the anatomical structures allowing to explore the four parathyroid locations.

A 75-year-old obese woman is diagnosed with hypercalcemia, hypophosphoremia and a high level of PTH during a work-out for joint pain.
Preoperative imaging includes a 3D-reconstructed cervico-mediastinal CT-scan. A computer program developed at the IRCAD-Strasbourg, named VrAnat™, Vr planning™, is used for that purpose. This 3D virtual reconstruction demonstrates three suspicious images respectively located at the right superior parathyroid territory, at the right latero-esophageal area, and at the left inferior parathyroid territory. A video-assisted cervical exploration, guided by this reconstruction, is decided upon. The objective is to find the three suspicious images and to explore the four parathyroid glands.

A 3cm median incision is carried out 2cm above the sternal notch. The right thyrotracheal groove is reached through a dissection performed laterally to the strap muscles and medially to the omohyoid muscle. A complete dissection of the lateral aspect of the thyroid lobe is obtained using blunt dissection and small instruments under endoscopic vision, which is provided by a 30-degree, 5mm scope (Storz, Tüttlingen, Germany). The recurrent laryngeal nerve is identified.

Dissection is now carried on above the inferior thyroid artery. It allows to rapidly identify a superior parathyroid adenoma, which will be resected. It exactly matches with one of the suspicious images.

Dissection is pursued anterior to the intersection between the artery and the nerve so as to find the right inferior parathyroid, which is healthy, underneath the capsule.

The latero-esophageal image is now searched for. It is nothing but an anthracosic lymph node.

The left side is approached by dissecting the left jugulocarotid gutter. The left recurrent nerve is identified. The left inferior parathyroid is identified and looks healthy. The suspected image is nothing else but a nodule of the apex of the thyrothymic ligament. The left superior parathyroid, which is healthy, can be finally identified in a strictly orthotopic position, although partially hidden behind a Zuckerkandl's nodule.

This cervical exploration has led to the dissection and visualization of the four parathyroid lobes in compliance with classical parathyroid surgery principles.
2.2. Video-assisted exploration of the four parathyroid glands for primary hyperparathyroidism

Operative technique

- 75-years-old woman
- Joint pain
- Hyper Calcemia: 3.10 mmol/l
- Hypophosphoreemia
- PTH 150 pg/ml
2.2. Video-assisted exploration of the four parathyroid glands for primary hyperparathyroidism

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We present a laparoscopic-assisted distal gastrectomy with D2 lymph node dissection for gastric cancer. Total omentectomy starts from the middle of the stomach toward the left side of the patient, while preserving the vasa rectae and keeping the colonic wall away from the energy-based device. After careful dissection and division of left gastroepiploic vessels with caution to the spleen, the lymph node dissection of station No. 4Sb can be achieved safely. The greater curvature can be easily freed after the vascular division using an energy-based device. By preserving the mesocolonic vessels cautiously, sufficient mobilization and exposure of the transverse colon and of the duodenum are required to approach station No. 6 safely. Once the right gastroepiploic vessels have been identified and ligated after careful dissection along the right colic artery toward...
the gastrocolic trunk, lymph nodes around station No. 6 can be dissected meticulously paying attention not to injure the duodenum or the pancreas. The sufficient mobilization of the posterior duodenal wall from the gastroduodenal artery and the common hepatic artery could be useful to approach the suprapancreatic area. Once the right gastric artery has been identified, lymph nodes around station No. 5 can be resected en bloc with those around station No. 12 at the hepatoduodenal ligament.

For a complete D2 lymph node dissection, we usually start to dissect the suprapancreatic area toward the splenic artery No. 11p. After the meticulous dissection of No. 11p as far as the middle portion of the splenic artery, the lymph nodes around the common hepatic artery No. 8a and the left gastric artery No. 7 can be dissected sequentially. The consecutive dissection around the celiac trunk No. 9 can be performed after division of the left gastric artery using double endoclips. Finally, the right paracardial and the lesser curvature area should be completely dissected for the
2.3. Laparoscopic-assisted distal gastrectomy with D2 lymph node dissection

The lymph node dissection of station No. 4Sb can be achieved safely.

lymph nodes around stations No. 1 and No. 3. Energy-based devices should be handled with great caution to avoid thermal damage to adjacent tissues, which may induce intraoperative vessel injury as well as postoperative pseudo-aneurysm.

For the well-trained surgeon, laparoscopic distal gastrectomy with D2 lymph node dissection can be a safe and feasible procedure.

Laparoscopic-assisted distal gastrectomy
3.1. Laparoscopic resection of distal esophageal leiomyoma

3.2. Incidental esophageal leiomyoma during reflux surgery

3.3. Round table mishaps around the hiatus

3.4. Rendezvous technique for residual choledocholithiasis
Esophageal leiomyomas are approximately 50 times less common than carcinomas, but they represent 80% of benign tumors of the lower esophagus.

An esophageal leiomyoma can be enucleated safely and effectively through minimally invasive surgery. The laparoscopic approach is a conventional option for this kind of tumor (located near or at the esophagogastric (EG) junction). Laparoscopic transhiatal enucleation is a safe and feasible procedure. This video demonstrates all the technical details of a laparoscopic excision of a large horseshoe-shaped leiomyoma of the lower esophagus. A conventional port placement is used to approach the hiatal region.
Esophageal leiomyomas probably account for 70% of all benign tumors of the esophagus [1-4]. Surgical removal is indicated for symptomatic patients or for a tumor with a progressive increase in size [2].

This is the case of a 36-year-old man, in whom an incidental leiomyoma of the distal esophagus was discovered at laparoscopic fundoplication for GERD. Due to the incidental finding of a large periesophageal mass, the surgeon elected to perform a partial posterior fundoplication instead of the planned 360-degree wrap with the goal to surgically re-explore the patient after further diagnostic testing. Also, the surgeon felt uncomfortable enucleating the lesion transhiatally.

Three months postoperatively the patient underwent a second operation by a multidisciplinary team of both gastro-intestinal and thoracic surgeons. At preoperative MRI the lesion was acknowledged as a probable leiomyoma. The second surgical
exploration failed due to dense adhesions between the stomach and the left liver. Here we show the third hiatal surgical exploration. Only minor adhesions were found and the access to the esophageal hiatus was therefore straightforward. The opening of the esophageal hiatus soon allowed for the visualization of a 3x4 cm lesion likely originating from the posterior esophageal wall. The macroscopic feature is that of a leiomyoma. The cleavage plane between the lesion and the esophagus is created with gentle blunt dissection. The stalk of the tumor, at the level of the cardia on the posterolateral right esophageal wall is selectively divided without entering the esophageal lumen. The muscular layer of the esophagus is then reapproximated to prevent outpouching. After crural closure, a short floppy Nissen fundoplication is built. The specimen is extracted through the 12mm camera port using an extraction bag. The pathology examination confirmed the diagnosis of leiomyoma. The upper gastrointestinal series performed on postoperative day one revealed no leakage and the patient was started on a liquid diet on day 1.

At least 50% of patients with esophageal leiomyoma remain asymptomatic, and these tumors are usually discovered as incidental findings during endoscopic examination of the upper gastrointestinal tract for unrelated reasons. In this patient the tumor was discovered at the time of surgery. In such a case we recommend either to postpone surgery whenever there is a significant doubt about the nature of the lesion, to fully study the patient and to optimize therapy, or to proceed to the excision of the tumor. Whenever the diagnosis is unclear no further surgical steps such as fundoplication should be carried out. For tumors of lower-mid esophagus, we prefer a laparoscopic transhiatal approach which is less invasive than the thoracoscopic approach.
3.2. Incidental esophageal leiomyoma during reflux surgery: what to do?

REFERENCES


Laparoscopic hiatal hernia repair has a recurrence rate [1-10] up to 66%. Mesh reinforcement for crural repair may reduce this risk. Complications related to prosthetic hiatoplasty for hiatal hernia repair are more common than previously reported. The use of prosthetic materials has been associated with esophageal stricture, erosion, and perforation [12-17]. Contributing factors include infection, ischemia and ongoing friction between the mesh and the esophagus. The risk of erosion with synthetic mesh is reported in 2.3% of prosthetic hiatal reinforcement. Biomaterial grafts were introduced with the promise to provide the benefits of a reinforced crural repair while minimizing these risks [10]. The aim of this round table is to discuss three emblematic complications related to the use of both synthetic and biological mesh hiatal reinforcement.
3.3. Round table: facing mishaps around the hiatus

Case 1: Synthetic mesh
A 50-year-old woman presented with severe dysphagia and important weight loss one year after open redo Nissen fundoplication with prosthetic crural repair for recurrent GERD and paraesophageal hernia. At re-operation, important esophageal stenosis and angulation were found arising from the keyhole-shaped polypropylene mesh with pseudo-diverticular dilatation of the distal esophagus. The esophagus was freed from the dense fibrotic capsule surrounding the prosthesis, and a myotomy was performed.
3.3. Round table: facing mishaps around the hiatus

Case 2: Biological mesh
A 61-year-old woman presented to the emergency room for an incarcerated type III hiatal hernia. A laparoscopic partial posterior fundoplication with U-shaped biological mesh (Surgisis™) reinforcement was performed as an emergency. A second operation was carried out 5 months after the first intervention for severe persistent dysphagia. At re-operation, there was severe scarring around the esophagus, arising from the mesh, with narrowing of the GE junction. The mesh was partially removed to free the esophagus and enlarge the hiatus.
Case 3: mesh migration
A 70-year-old man presented with new-onset dysphagia and weight loss seven months after a Nissen-Rossetti fundoplication with hiatal hernia prosthetic mesh repair (Parietex™, Covidien Surgical, France). Esophago-gastro-duodenoscopy (EGD) showed mesh erosion into the esophageal wall at the gastroesophageal junction (GEJ). After failure of Argon Plasma Coagulation (APC) ablation, the patient was referred to our center.

The CT-scan revealed a small cavity lateral to the GEJ. A second attempt at APC failed. The mesh was grasped with a foreign body forceps and secured with a polipectomy snare. Strong traction in retroflexion allowed to remove the majority of the mesh. A residual piece secured by a suture was excised using endoscopic scissors. Fluoroscopy showed a small peri-esophageal cavity. A 12cm x 22mm covered self-expanding metal stent (SEMS) (HANAROSTENT®) was delivered to seal the cavity and prevent stenosis. After a normal swallow study performed the next day, the patient resumed a liquid diet. Five weeks later, at SEMS removal, endoscopy showed a decreased cavity volume. A new SEMS was
placed for 5 additional weeks. At removal, there was no stricture and no residual cavity. The patient was symptom-free at three months.

Mesh reinforcement may reduce but not suppress the risk of recurrence in the setting of large paraesophageal hernia, and is obviously not the single factor responsible for recurrence. In addition, meshes can lead to significant complications with devastating consequences. The use of biological meshes does not protect against the risk of severe inflammation and scarring around the esophagus.

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3.3. Round table: facing mishaps around the hiatus


Case presentation
An 89-year-old woman was admitted to the emergency room for fever, right epigastric pain, and jaundice. A CT-scan showed both cholelithiasis and choledocholithiasis associated with intra- and extra-hepatic bile duct dilatation. A juxtapapillary duodenal diverticulum was also noted.
Management options
1. Repeated ERCP/ES (endoscopic sphincterotomy)
2. Laparoscopic cholecystectomy and CBD exploration by either the transcystic approach or choledochotomy
3. Intraoperative ERCP/ES
4. Open common bile duct exploration
5. Postoperative ERCP/ES

All options are possible and reported in the literature. CBD exploration at laparoscopic cholecystectomy can be performed by either a transcystic approach or choledochotomy [1-3].

The transcystic approach is preferable over the transcholedochal approach in case of smaller stones < 6mm or smaller bile duct < 6-10mm because of higher success rate and fewer complications [4].

ERCP and ES before, during or after laparoscopic cholecystectomy show similar efficacy, morbidity and mortality as compared to that of laparoscopic CBD exploration [5-6].

Intraoperative ERCP is a single-stage option to intraoperative CBD exploration. Difficult ampullary cannulations can be facilitated by the operative placement of a guidewire through the cystic duct into the duodenum. Pancreatitis is a concern but when combined with laparoscopy, the injection of contrast in the pancreatic duct is avoided and excellent short-term results have been reported [7].

In consideration of the patient's age and associated co-morbidities, we decided to pursue an endoscopic sphincterotomy as the first line of treatment. ERCP was performed with a standard lateral view scope, and a giant peri-ampullary diverticulum was visualized at the level of the second duodenum. The edge of the diverticular pouch was carefully explored to find the papilla on the rim of the diverticulum. The correct angle of entry could not be attained despite placement of the scope within the diverticular neck. Several attempts to pass a sphincterotome were ultimately unsuccessful.
Managing ERCP failure

After failed ERCP, the decision was made to perform laparoscopic cholecystectomy with intraoperative cholangiography and common bile duct exploration. In case of failure of ERCP due to duodenal diverticulum to avoid surgery or in patients unfit for surgery, a percutaneous transhepatic biliary drainage followed by endoscopic rendezvous is a possibility. It is associated with a complication rate of 15% and a mortality rate of 0-5.6% [11].

At laparoscopy, significant inflammation was encountered in exposing the triangle of Calot. Once the cystic duct and artery were clearly identified, a clip was placed on the cystic duct close to the gallbladder neck. With the gallbladder occluded, the cystic duct was opened with significant bile return, an indirect sign of distal biliary obstruction. Transcystic cholangiography demonstrated the presence of complete occlusion at the level of the papilla without flow into the duodenum, raising the suspicion of ongoing stone blockage. Intra-operative cholangiography is possible in 93% of patients.

Given the CBD dilatation-related clinical need to decompress the biliary tree in the setting of cholangitis, a laparoscopic common bile duct exploration was performed. Choledochoscopy with a 5mm Karl Storz endoscope revealed no proximal abnormality and during distal exploration, the scope passed into the duodenum. Despite not visualizing stones, the surgeon felt that the CBD had been cleared. A completion cholangiogram at this time could have confirmed clearance of the CBD, but was not performed. The CBD was drained by closing the choledochotomy over a T-tube with interrupted 3/0 PDS sutures. Cholecystectomy was completed without complication.

Follow-up

The postoperative course was uneventful, the liver function tests normalized and the patient was discharged with the T-tube. At cholangiography, 4 weeks postoperatively prior to the removal of the T-tube, residual choledocholithiasis with mild intra- and extrahepatic biliary dilatation was discovered.
3.4. Radiological endoscopic trans-Kehr rendezvous technique for residual choledocholithiasis in a patient with giant juxtapapillary duodenal diverticulum

Management of retained CBD stones
Since the first ERCP failed due to the technical challenge of an intradiverticular papilla, a radiological endoscopic rendezvous technique was attempted.
With the patient under general anesthesia and in supine position, a cholangiography was carried out through the T-tube. A 4.5-meter 0.0025 French VisiGlide guidewire (Olympus) was inserted in the T-tube and gently advanced. Aided by its super-elastic alloy and hydrophilic coatings, the guidewire was passed into the duodenum.
The guidewire was secured to the drain proximally. Its distal end was grasped with a standard biopsy forceps and fed into the endoscope.

The guidewire was then exteriorized through the scope. A standard triple-lumen sphincterotome was advanced over the guidewire and sphincterotomy was performed. A sphincteroplasty was added to facilitate remove the residual stones by means of a 15ml balloon catheter inflated to 8mmHg for one minute.

Multiple stones between 2 and 6mm were then removed by running the balloon catheter along the common bile duct. Completion retrograde cholangiography showed no residual lithiasis. The T-tube was left in place and clamped. Three days later, as liver function tests normalized, a final T-tube cholangiography was performed before removal of the T-tube.

Conclusions
Modern surgical, radiological, and endoscopic tools have provided the surgeon with multiple options and algorithms in the treatment of choledocholithiasis. It is important for surgeons to understand the many techniques that can be employed in the treatment goals of biliary drainage, stone clearance and gallbladder resection.
3.4. Radiological endoscopic trans- Kehr rendezvous technique for residual choledocholithiasis in a patient with giant juxtapapillary duodenal diverticulum

REFERENCES


Recent breakthroughs in cutting-edge minimally invasive strategies

4. The anubiscope platform

New Technology

Recent breakthroughs in cutting-edge minimally invasive strategies
Recent advances in interventional endoscopy in conjunction with the introduction of NOTES have highlighted the limitations of existing flexible endoscopes when performing complex tasks. In 2005, the IRCAD and Karl Storz Endoscopy began a collaborative development to create an interventional endoscopic platform to enable complex surgery both inside and outside the lumen of hollow organs. To this aim, a multi-purpose platform for endoluminal and transluminal procedures was designed under the name "Anubiscope™".

The Anubiscope™ development went through 4 generations of prototypes that explored different designs including a mother and baby scope configuration before coming to its definitive form of a flexible 110cm long, multifunctional platform. Its 4-way articulating endoscope has a 16mm articulating vertebrae section with an 18mm distal tip shaped like a trocar to facilitate introduction at the
enterotomy site. The distal head incorporates two opposing movable arms with two 4.2mm working channels. A central 3.4 channel provides suction and can be used for additional retraction. The jaws work similarly to a blunt tip trocar when in the closed position. In the open position, the jaws create triangulation of the working channels by generating opposable angles for the 2-way articulation instruments capable of deflection and rotation.

Experimental work focused on peroral transluminal and intraluminal surgery in animal models. NOTES transgastric and transvaginal cholecystectomies were completed with little or no need for transparietal assistance. Gastric endoscopic submucosal dissection was successfully and intuitively achieved by both trained endoscopists and unexperienced operators. Suturing and knot-tying, although still challenging, were possible. As a logical
next step, cadaver models were then used to confirm the results achieved in the laboratory. Once approved for clinical use, the platform was used to perform transvaginal cholecystectomy for symptomatic uncomplicated cholelithiasis.

The Anubiscope™ highlighted the challenges in reproducibility of precise tasks and the overall usability of an endoscopic operating platform. These challenges are being addressed by ongoing developments focused on optimizing visualization, dexterity, ergonomics and surgeon training with robotics. Visualization can be augmented through visual servoing where feedback information extracted from a vision sensor controls the motion of the endoscope when the target is moving, as happens to visceral organs during respiration. Dexterity and ergonomics can be augmented by robotization of instruments and design of a surgical control console. In addition, by moving the surgeon to an operating console, both inherent conflicts with a second operator and limited dexterity due to conflicting instrument handles are overcome.

Finally, a robotic control platform allows for simulation and training.

With the growing capabilities of interventional endoscopy and the growing focus on minimally invasive surgery, it was somehow inevitable that the boundaries of endoscopy and surgery would become blurred. The Anubiscope™ has demonstrated its potential in bringing surgical concepts into the lumen of hollow organs by overcoming significant limitations of current flexible endoscopes.
Alsace is a region of many talents. Seep into our culture, history and traditions starting with an exquisite wine voyage.

Cultural escapes

5

Alsace is a region of many talents. Seep into our culture, history and traditions starting with an exquisite wine voyage.
Wine is so ingrained in French culture that French cuisine would not be the same without it.

Alsace is a renowned region of wine production in France. It is known for the Route des vins, meaning “wine route”. It draws tourists from all over the world and has contributed to the success of Alsace wines over the past 50 years.

Alsace is a land of contrasts and enjoys a great diversity of landscapes. The region has a dry and temperate climate, a complex geology, favorable soils, and an ideal exposure for its vineyards.

Alsace has a semi-continental climate as it is sheltered from oceanic influences by the Vosges mountains. This climate offers a fantastic advantage to tourists and provides the perfect conditions for winemaking as it encourages the slow, extended ripening of the grapes, resulting in elegant, complex aromas and flavors.

5.1. The sommelier Serge Dubs will introduce us to the delights of Alsace wines.
The Route des Vins is famous for its exquisite natural beauty and leads visitors across rows of undulating, vine-covered hills, and through delightful quaint villages.

Our wine voyage begins in one of the villages along the Route des Vins. We shall visit the beautiful setting of the Auberge de l'Ill, one of the temples of French gastronomy, located on the banks of the Ill river. The restaurant has been bestowed with 3 Michelin stars since 1967. Four generations of chefs have built the reputation of this extraordinary restaurant where family tradition is revisited with a zest of modern touch by the current executive chef, Marc Haeberlin.

In this renowned establishment, the sommelier Serge Dubs will introduce us to the delights of Alsace wines, three of which were recently included in the 2011 "Hot Wines" ranking by Wine Spectator.

In this issue, Serge will educate our palate with a Riesling from the Trimbach winery "Cuvée Frédéric Emile". This incredibly fine wine is produced from very ripe grapes handpicked during the last weeks of the harvest. This Riesling is a dry, round and powerful wine, elegantly enveloped by mineral nuances resulting from the ancestral combination of Riesling grapes with a flourishing soil.

Alcohol can damage your health and should be consumed with moderation.
IRCAD shapes up for a revolution in the learning experience creating a vibrant multimedia iPad journal in synch with cutting-edge technologies for continuing medical education.
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IRCAD (Research Institute against Digestive Cancer) was founded in 1994 within the premises of Strasbourg's University Hospital. It pools digestive cancer research laboratories, a research and development department in computer sciences and robotics, and a training centre in minimally invasive surgery (EITS - European Institute of TeleSurgery).

**European Institute of TeleSurgery (IRCAD France)**
Located within the compounds of Strasbourg's University Hospital, the EITS (European Institute of TeleSurgery) has become internationally renowned over the past 18 years and makes full benefit of the IRCAD's 8000 square meters.

WebSurg is a free virtual surgical university, accessible worldwide through the Internet. Our goal is to provide surgeons, scientific societies and the medical industry with the first online continuing medical education in laparoscopic surgery and information on the latest developments in laparoscopic surgery, including NOTES and robotics.

**Asia Institute of TeleSurgery (IRCAD Taiwan)**
The AITS, was inaugurated in May 2008, and is equipped with a 7300 square meter structure. It is one of the largest training centers in minimally invasive surgery and is ideally located in Asia. It provides 23 operating tables suitable for training on live tissue.

**American Institute of TeleSurgery (IRCAD América Latina)**
IRCAD América Latina was inaugurated in July 2011
With a surface of more than 7,000 m², IRCAD América Latina is one of the largest training centres in minimally invasive surgery in America.
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POEM

Per-Oral Endoscopic Myotomy (POEM)

Termes connexes du glossaire

Faire glisser ici les termes connexes

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Chapitre 1 - 1.1. A novel permanent therapy for esophageal achalasia: peroral endoscopic m
Unsuccessful

Inability to achieve cannulation at ERCP is reported in 5-20% of cases [8]. Periampullary diverticulum is associated with failed cannulation. Failure rates are higher in patients with intradiverticular papillas than juxtapapillary diverticula [9]. Many tips and tricks have been described for difficult cannulation within the diverticulum such as everting the papilla outside the diverticulum before cannulation. EUS-guided bile duct access for rendezvous drainage in the setting of intradiverticular papilla is an interesting endoscopic approach that has been described [10].