Dear colleagues,

EURO-NOTES 2012 in Prague is fast approaching. The meeting concept has been further developed and this year the focus will include advanced interventional endoscopy.

Hands-on training on live animals will for the first time enhance the workshop. Offered to a limited number of registrants on the Saturday, participants may sign in for this activity when registering for the workshop.

We would like to thank all abstract submitters for their interest in our workshop and submitted papers. A record number of abstracts reached us and a limited number of registrants on the Saturday, Hands-on training on live animals will for the first time enhance the workshop.

01 Visual control – evaluation of the most suitable visualization angle for NOTES platforms
D. Wilhelm, E. M. Losher, A. Schneider, T. Baude, A. Meining, H. Feussner

Objective of the study: A perfect visualization of the operative field is essential for efficient and secure manipulation during any intervention. While in laparoscopic surgery a top view with an angle of 30–60° is preferred, flexible endoscopes and NOTES platforms currently provide an in-axis visualization (z-axis). Interestingly, in open surgery the visualization angle is even steeper. The impact of different visualization angles on the operative performance and the mental work load has not yet been investigated, but would be important for the construction of future NOTES platforms.

Methods and procedures: Randomized, double blinded study (n = 48 individuals) using a standardized laparoscopic task and a multi-angle laparoscopic scope for evaluation. Assessment of the operative performance was achieved by means of time measurement, video evaluation and electromagnetic tracking of the instruments in use. The mental work load was assessed by different vegetative parameters (pulse variability, width of pupils... and by using a known questionnaire (NASA TLX). All individuals had to perform the task under 8 different viewing angles.

Results: Time required to complete the task was significantly shorter by visualization under an angle of 30 and 70° (p = 0.06), although comparison of the path length and handling speed was not significant. Most individuals preferred visualization by the 30 and 70° optical system. Identically, the mental work load was significantly improved for the 30° and 70° viewing angle, as expressed by the width of pupils (p = 0.01) and the eye saccades (p = 0.03), as well as by the heart rate variability (p = 0.04).

Conclusions based on the results: According to our results in-axis visualization, as currently provided by most NOTES platforms, leads to a worse operative performance and a higher mental work load. A viewing angle about 70° is the most suitable and should therefore be used for construction of future interventional endoscopes. This requires an independent controllable optic, which is separated from the instrument axis.

02 Comparison of endoscopic sutting techniques for closure of the transgastric entrance site for NOTES procedure

Background: Endoscopic closure of the transgastric wall incision created to enter the peritoneal cavity remains problematic. Several techniques (closure with endoscopic clips, T-bars, stapling devices, etc.) have not achieved quality of closure comparable to surgical suturing.

Aim: To compare clinical and histological results of continuous suture line and interrupted stitches created by novel endoscopic suturing device (Overstitch®, Apollo Endosurgery, Inc, Austin, TX) in a randomized, prospective, controlled animal trial.

Methods: Standard transgastric access to the peritoneal cavity was achieved utilizing gastric wall puncture with subsequent dilation with 20-mm CRE balloon (Boston Scientific, Natick, MA). After brief peritoneoscopy the endoscope was withdrawn into the stomach and all animals were randomly assign to gastric incision closure with either continuous (4–6 sequential punctions of each site of the gastric wall incision with subsequent tightening and cinching the suture line) or interrupted line of stitches (one puncture on each site of the incision with subsequent cinching). After completion of the suturing the stomach was infused with carbon dioxide and air-leaf test was performed to prove air-tightness of the closure. All animals were survived for 14 days and then sacrificed for histological examination.

Results: 16 survival animal experiments (8 in each group) were successfully completed. Suturing of the gastric wall incision was easily achieved and airtight in all animals. The mean time to complete continuous line of sutures was 7.43 ± 2.59 minutes, the mean time to complete the closure with interrupted stitches was 10.49 ± 3.8 minutes. There were no post-procedural complications in any animals.

Postmortem examination revealed no signs of peritonitis or other intra-peritoneal complications in both groups. Histological examination in all animals demonstrated complete transmural healing with good opposition of gastric wall layers.

Conclusion: Overstitch® endoscopic suturing device is easy to use, reliable and operator-friendly instrument. Closure of the gastric wall incision with continuous suture line was faster, both the clinical and histological results were equally successful in both groups.

03 Gastric volume reduction created by the articulating circular endoscopic stapler for the treatment of obesity – preliminary safety results
T. Verlaan, MD, E. M. Mathus-Vliegen, MD, PhD, E.A.M.L. Veldhuysen, J.H. Eshuis, MD, P. Fockens, MD, PhD

Objective: Dietary and medical treatment of obesity often fail. Surgical treatment is successful but carries considerable morbidity. Endoscopic treatment could be an alternative with less morbidity. A minimally invasive technique was developed and studied on an animal model. We now present the preliminary results of the first human trial of a gastric volume reduction created by the Articulating Circular Endoscopic Stapler (ACE) for the treatment of obesity. The aim of this study is to evaluate safety in terms of adverse events.

Methods: Inclusion criteria consisted of a BMI of 40–45 kg/m² or 30–39.9 kg/m² plus obesity related co-morbidities, age 18–50 and ASA class I or II. Patients with prior oesophagogastroduodenal or bariatric surgery were excluded. Procedures were performed under general anaesthesia after intubation. A 20 mm endogastric tube was placed, through which the ACE stapler was advanced. With the stapler a maximum of 10 plications were created in the fundus and antrum of the stomach to realize a gastric volume reduction.

Results: Between April 2012 and May 2012, 5 female patients (median age 37 years, range 28–49) with a BMI of 42 kg/m² (range 40.2–44.9) underwent an endoscopic gastric volume reduction using the ACE stapler. Median procedure time was 156 minutes (range 72–233). All patients were admitted for one night postoperatively. No patient was readmitted and no serious adverse events occurred. Adverse events were gastro-intestinal pain (n = 3, range 2–3 days), constipation (n = 1, 14 days) and diarrhoea (n = 1, 21 days). All adverse events were mild and were treated conservatively.

Conclusions: Preliminary results of this study indicate that a minimally invasive gastric volume reduction created with the Articulating Circular Endoscopic stapler is a safe procedure. More studies are needed to evaluate whether this could be a safe and effective minimally invasive treatment alternative for obesity patients.
Introduction: Natural orifice transluminal endoscopic surgery is a less invasive surgical technique for creating a gastrojejunal anastomosis without the need of skin/parietal incisions. Such procedures may be useful for bariatric procedures and for treating gastric outlet obstruction. A pure natural orifice transluminal endoscopic gastrojejunostomy remains experimentally and technically challenging despite many efforts in developing the technique. The aim of this study is to determine feasibility, efficacy and safety of a pure endoscopic NOTES gastrojejunal anastomosis procedure (GJA) using a simulated gastric outlet obstruction (pyloric closure) survival swine model.

Methods: This prospective animal study was carried out under University of Aix-Marseille ethical committee approval. All procedures were performed on 20 to 30-kg domestic pigs, under general intravenous anesthesia and aseptic conditions, including sterilized double working channel endoscope and accessories. This procedure has been previously established according to our preliminary experience of performing a pure GJA on 7 animals (in press) as follows: 1) gastric incision with a needle-knife, 2) Access of the peritoneal cavity, 3) selection and presenting the jejunal loop for anastomosis, 4) transmural transfer of the loop into the stomach, 5) exposure of the loop in the stomach using a stoma creation technique using a fully-covered metallic biliary stent, 6) Olin-Jones incision, 7) a full-thickness GJ anastomosis with T-tag sutures using a prototype endoscopic suturing device (Brace Bar, Olympus, Japan), 8) removal of the stent. For the present experiment we added a pyloric closure procedure using the Brace Bar endoscopic suturing device. Antibiotics prophylaxis was administered for 7 day-period. Animals were assessed daily for clinical outcome and ponderal changes. The pigs were euthanized after 3 weeks. The patency of the gastrojejunostomy (GJ) was confirmed at postmortem examination.

Results: In total, nine pure NOTES gastrojejunal by-pass procedures were performed. All the procedures were successfully achieved. The mean operative time was 108 ± 26 minutes [65-142]. Each GJA was endoscopically sutured using 4 to 7 T-tag sutures (mean of 5.55 ± 1.30). One or 2 T-tags were used for pyloric closure. There was no complications during the procedure. Five of 9 pigs survived for 3 weeks. Their mean weight was 29.5 kg at baseline versus 27.7 kg at 3 weeks follow-up. Diarrhea was observed in 4 pigs. Endoscopic contrast study confirmed that all the gastrojejunostomies were patent. The pylorus was most of the time incompletely closed. On postmortem examination, the GJA was about 50 – 60 mm in maximal diameter without evidence of stricture. Four pigs died from anastomotic dehiscence complicated with septic peritonitis.

Conclusion: GJA with pyloric closure is technically feasible using a pure NOTES approach using standard endoscopic equipment. This procedure is efficient resulting in a patent anastomosis and weight loss in all surviving animals. Anastomotic dehiscence is a major concern since the postoperative mortality rate due to the ongoing contamination from the obstructed stomach. Further improvements for this model for reducing the risk of anastomotic dehiscence may be creation of a 2-step procedure in separate occasions (GJA anastomosis as the initial procedure followed by anastomotic dilatation and pyloric closure).

Objective: For pure NOTES procedures flexible endoscopes are one precondition. However controlled steering is only possible for the tip of the scope, whereas the rest part of the endoscopic gastrojejunostomy remains experimentally and technically challenging despite many efforts in developing the technique. The aim of this study is to determine feasibility, efficacy and safety of a pure endoscopic NOTES gastrojejunal anastomosis procedure (GJA) using a simulated gastric outlet obstruction (pyloric closure) survival swine model.

Methods: This prospective animal study was carried out under University of Aix-Marseille ethical committee approval. All procedures were performed on 20 to 30-kg domestic pigs, under general intravenous anesthesia and aseptic conditions, including sterilized double working channel endoscope and accessories. This procedure has been previously established according to our preliminary experience of performing a pure GJA on 7 animals (in press) as follows: 1) gastric incision with a needle-knife, 2) Access of the peritoneal cavity, 3) selection and presenting the jejunal loop for anastomosis, 4) transmural transfer of the loop into the stomach, 5) exposure of the loop in the stomach using a stoma creation technique using a fully-covered metallic biliary stent, 6) Olin-Jones incision, 7) a full-thickness GJ anastomosis with T-tag sutures using a prototype endoscopic suturing device (Brace Bar, Olympus, Japan), 8) removal of the stent. For the present experiment we added a pyloric closure procedure using the Brace Bar endoscopic suturing device. Antibiotics prophylaxis was administered for 7 day-period. Animals were assessed daily for clinical outcome and ponderal changes. The pigs were euthanized after 3 weeks. Their mean weight was 29.5 kg at baseline versus 27.7 kg at 3 weeks follow-up. Diarrhea was observed in 4 pigs. Endoscopic contrast study confirmed that all the gastrojejunostomies were patent. The pylorus was most of the time incompletely closed. On postmortem examination, the GJA was about 50 – 60 mm in maximal diameter without evidence of stricture. Four pigs died from anastomotic dehiscence complicated with septic peritonitis.

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8 Transanal single port access to facilitate distal rectal mobilization: a step towards colorectal NOTES surgery
Albert M. Wolthuis, MD, André D’Hoore, MD, PhD

Objective of the study: Laparoscopic rectal mucosal or intersphincteric sleeve resection is challenging and technically demanding, especially exposure and mobilization of the most distal part of the rectum can be hazardous. The use of a single port access device placed in the muscular anal canal after incision of the sleeve at the appropriate level is proposed to facilitate dissection without sphincter damage. Furthermore, if transanal mobilization of the rectum can be progressed maximally in a cranial way, a complete transanal NOTES resection might become possible. This pilot study assessed the feasibility of a single port transanal rectal mobilization.

Patients and methods: All patients treated by a laparoscopic-assisted transanal single port rectal mobilization were included in the study. Incision of the endopelvic fascia and mobilization of the distal rectum and mesorectum was performed by a single port device under direct control. The created pneumo-retroperitoneum further facilitates laparoscopic dissection of the more proximal part.

Results: Four female patients with a median age of 54 years (range: 51–83) had this procedure. Indications were intractable supravacularis fistula, Crohn rectitis with tubulovillous adenoma and faecal incontinence. In 3 patients a hand-sewn prolapse was made and in 1 patient a proctectomy was performed. In one patient, a transanal NOTES resection might become possible. This pilot study assessed the feasibility of a single port transanal rectal mobilization.

Conclusions: The prototype of the instrument changer has been evaluated successfully in in-vivo experiments. Actually a new manipulator is developed and the instrument changer will be an important sub-component of the whole concept. In the future the user can change the instruments by direct command via the system and is not relayed on the help of an assistant.

10 Oral chlorhexidine and microbial contamination during gastroscopy. Implications for transgastric surgery, A randomised trial
Anders Moller Donatsky, Barbara Juliane Holzknecht, Magnus Apis, Peter Vilmann, Søren Meisner, Lars Nannestad Jørgensen, Jacob Rosenberg

Background: A concern associated with transgastric natural orifice transluminal endoscopic surgery (TG-NOTES) is the risk of contamination and intraabdominal infection with microbes introduced from the access route. An effective decontamination regimen is needed before the technique can be implemented in routine clinical practice. The aim of this study was to evaluate the effect of oral decontamination with chlorhexidine on microbial contamination of the endoscope during a gastroscopy.

Results: A total of 160 patients were approached of which 109 were included in the study. Due to exclusions after randomisation, 100 participants were available for final analyses. Chlorhexidine mouth rinse resulted in a significant reduction of CFU/ml in the endoscope samples (p = 0.001). There was no operation of microorganisms with abscess forming capabilities were still equally present in both groups. PPI treatment was associated with significantly higher CFU counts in both the gastric aspirate (p = 0.004) and endoscope samples (p = 0.049).

Conclusion: Chlorhexidine mouth rinse was effective in reducing microbial contamination of the gastroscopy, but microorganisms with abscess forming capabilities were still present. Oral chlorhexidine needs to be combined with other measures for an effective decontamination regimen prior to TG-NOTES. PPI treatment significantly increased CFU/ml and should be discontinued before TG-NOTES.

11 Transanal endoscopic operations: A safe and effective alternative to tems
Hosy Koh, Stephen Magill, Mark Vella and Andrew Renwick

Introduction: Rectal surgery is perhaps the easiest conduit for NOTES. Traditional TEMS was the technique of choice for small rectal lesions. Most recently the transanal endoscopic operation (TEO) technique has gained a foothold as it is cheaper than TEMS, and surgeons have more refined laparoscopic skills. We report our early experience with TEO’s in our unit.

Methods: TEOS were performed between January 2010 and May 2012 were identified. All cases were discussed preoperatively at our colorectal MDT meeting. Case notes were reviewed retrospectively for demographic, clinical and histological data.

Results: 14 cases were performed by 2 colorectal surgeons. There were equal numbers of men and women, with a mean age of 70 (52–80). 5 patients were ASA 3–4. The lesions were equally located anteriorly or posteriorly, at 3–15 cm from the anal margin. Pre-operative enema and postoperative antibiotics were standard protocol. All cases bar one were carried out in the lithotomy position, with a mean operative time of 67 minutes (25–110 minutes). 4 cases were adenocarcinoma, 10 were benign adenomas. All adenocarcinomas were diagnosed pre-operatively and were completely excised T1 lesions. One patient had T1-Kikuchi Sm3, and proceeded to an APER, where there was no residual tumour and no lymph nodes involvement. The other 3 patients had routine surgical and endoscopic follow-up. The patient who had APER had a breach of the vagina during the TEO and was referred peri-operatively.

Conclusion: We have shown that TEOs can be used safely and effectively to treat rectal lesions, including certain early T1 adenocarcinomas, thereby avoiding the morbidity associated with conventional open and laparoscopic approaches. Patients are still at risk from operative and cardiorespiratory complications, and should be selected appropriately. We welcome developments in the...
instrumentation to aid the frustrating elements to this emerging technique.

12 Totally stapled gastrojejunal anastomosis using hybrid NOTES – single 12 mm trocar approach in a comparative animal model

Uno Polese, Stefano Migliavacca, Paolo Mungo, Roberto Rizzato, Roberto Luissotto, Lorenzo Norberto

Objective of the study: The aim of this study was to evaluate the feasibility and safety of a totally stapled gastrojejunal anastomosis performed with hybrid NOTES – single 12-mm trans-abdominal trocar approach in a porcine model.

Methods and procedures: The procedure was carried out on 10 domestic pigs (7 acute and 3 survival models) of 45 kg using a NOTES hybrid technique with a gastroscopy and a 12-mm Hasson trocar, positioned in the left hypochondrium. At the end of the procedure a mechanical circular 21 mm gastrojejunal anastomosis was performed by inserting the stapler through a small gastrotomy, after enlarging the trocar incision. In 8 pigs it was performed a lateral-lateral gastro-jejunal by-pass, in 2 pigs a Roux-en-Y gastro-jejunal by-pass. Survival models were followed up for 2 weeks and then a gastroscopy and a necropy were performed to look for complications.

Results: In all 10 cases the procedure was completed percutaneously using a single 3 cm abdominal incision, without intraoperative complications. The mean operation time was 2 hours, and endoscopic investigation showed that the anastomoses were intact, patent and airtight. In survival models no complications were found during follow-up and anaesthesists were satisfied with the control at control. Pigs fed spontaneously in the first postoperative day, and at the end of the follow-up had grown a mean of 2.5 kilograms. Analgesic has been suspended in the second postoperative day.

Conclusions based on the results: Totally stapled gastrojejunal anastomosis using a hybrid NOTES – single 12 mm trocar approach is a simple and safe procedure in the porcine model. Further studies are warranted to evaluate the functional and metabolic results of this procedure.

13 Comparative study of NOTES alone vs. NOTES guided by a new image registration system for navigation in the mediastinum: A study in a porcine model

Henry Córdova, Raúl San José Estépar, Antonio Rodríguez-D’Jesús, Graciela Martínez-Pall, Pedro Arquís, Cristina Rodríguez de Miguel, Ricard Navarro-Ripoll, Juan M. Perdomo, Miriam Cuatrecasas, Josep Llach, Kirby G. Vosburgh, Gloria Fernández-Esparra

Background and study aims: Natural Orifice Transluminal Endoscopic Surgery (NOTES) mediastinoscopies were regular and well-functioning at control. Pigs fed spontaneously in the first postoperative day, and at the end of the follow-up had grown a mean of 2.5 kilograms. Analgesic has been suspended in the second postoperative day.

Methods and Procedures: All survival experiments were performed on female Yorkshire pigs. In Group-A a laparoscopic overview was used to facilitate endolumenal colon-wall resection performed with a standard colonoscope. T-tags were endolumenally applied circumferentially to a hypothesised colon-lesion and were used to gently and accurately retract the intestinal wall into the attached over-the-scope-clip system. For pre-resection tissue closure the nitinol-clip was applied as soon as complete intestinal wall retraction had been verified. The inverted colon-wall was then snare-resected and specimens (N=2) were easily withdrawn from the colon. In Group-B the same technique was performed purely endolumenally without laparoscopic overview (N=5). In Group-C solely suction, instead of T-tag suction, was used for tissue retraction (N=6). All animals were survived for 14 days followed by necropsy and histological analysis.

Results: EFTF in the colon was achieved in all attempted interventions (13/13). Overall mean intervention time was 33 ± 21 min. The full-thickness colon specimens had a mean diameter of 23 mm ± 6 mm.

In Group-A no signs of leakage or infection were found. At the resection sites normal healing with without stenosis was observed macroscopically and histologically. The clips were already passed with the stool. In Group-B the first two EFTF (2/5) also resulted in appropriate healing with the clips already ready passed. However, the other three resections led to intestinal fistulas (3/5). No related fistulas was found in Group-C, with some clips still in place (4/6). However, pure endoscopic suction without T-tags impaired accurate resection with appropriate safety margins barely possible.

Conclusion: Endolumenal full-thickness resection in the colon, using T-tags for tissue retraction and an over-the-scope-clip for pre-resection closure seems appealing but only if laparoscopic over-view is used. At this stage pure endolumenal EFTF cannot be recommended.

15 A new instrument for endoscopic submucosal dissection: The “EndoDissector”

Alexander Meining, Daniel Roppenecker, Armin Schneider, Tim Lüth

Background: Although effective for treatment of early neoplasms, endoscopic submucosal dissection (ESD) can be technically demanding and time consuming. Furthermore, use of multiple instruments is often mandatory for performing various steps associated with the procedure. Hence, we aimed to design, create and evaluate a new instrument for ESD, the “EndoDissector”.

Methods: Gastric ESDs of areas from 15 to 30 mm including circumferential incision and coagulation of bleeding vessels were performed using a single device. Incision was done with the prototype instrument in a closed position using cutting current. Submucosal dissection was performed using an approach comprised by four steps: 1) open jaws of instrument, 2) grasp fibers, 3) elevate tip to avoid contact with muscle layer, 4) dissect fibers using cutting current. Bleeding was terminated by grasping vessels and applying coagulation current.

Results: The procedure was successfully performed in a total of 6 pigs. The new instrument was successful performing all steps as needed (incision, discission, coagulation of bleeding vessels). Time needed for the complete intervention was 35 to 70 minutes.

Conclusions: The new instrument has potential advantages in comparison with standard instruments used for ESD. All steps can be performed with a single instrument and the technique of lifting submucosal fibers during dissection potentially decreases risk of perforation.

16 Ultimate less invasive laparoscopic surgery by using needle devices and NOSE for rectal cancer

Masaaki Ito, Atsushi Koyama, Norio Saito

Objective of the study: The aim of this study is to develop a less invasive surgical technique by using needle devices and trans-rectal specimen extraction for patients with rectal tumors and to evaluate clinical results after the surgery.

Methods and procedures: In this study, we used needle graspers of 2 or 3 mm in size in performing laparoscopic surgery for rectal tumors. Gener al laparoscopic anterior resection was performed by using these devices. Then rectal mucosa was washed out with clamping at the distal side of the primary tumor. Rectal wall was directory transected by electric cautery or the ultrasonic Harmonic Scalpel under laparoscope, with keeping 2 cm of distal margin at least. After an operation to anise side, the anus and the anus by special retractor circumferentially and distal stump was sutured and closed from the anus. By pulling the suture, the specimen was removed per rectal cut-end and anvil head was placed at the oral colon of the anastomotic site and push it back to the abdominal cavity. Rectal cut-end was closed in purse-string sutures from the anus. Reconstruction was performed by single stapling technique (SST) under laparoscope. Five patients with rectal cancer and rectal carcinoma underwent this operation. We evaluated perioperative outcomes after the operation.

Results: We had not experienced operative deaths in this study. R0 curative resections were done for all the patients. Median operation time was 270 min and amount of bleeding was 100 ml. There was one postoperative leakage in the
first patient without diverting stoma and recovered conservatively without emergency operation. Greatest incision in this operation was less than 10 mm and the other incisions were 2 or 3 mm in size. Patients were satisfied with less pain and complications after this operation.

Conclusions based on the results: Laparoscopic surgery with needle use and trans-rectal specimen extraction is feasible and offer less invasive-ness to patients with rectal tumors.

17 Comparison of hemodynamic and inflammatory changes between transoral and transsthoracic thoracoscopic surgery

Yun-Hen Liu, Yen Chu, Chien-Ying Liu, Yi-Cheng Wu, Ming-Ju Hsieh, Tzu-Ping Cheng, Ying-Kai Chao, Ching-Yang Wu, Hsu-Chia Yuan, Po-Jen Ko, Hui-Ping Liu

Background: Natural orifice transluminal endoscopy has been developed for abdominal surgical procedures. The aim of this study was to compare the surgical outcome between a novel transoral approach and a standard transsthoracic approach for the thoracic cavity in a canine model.

Methods: Dogs were assigned to transoral (n = 14) or standard thoracostomy (n = 14). Each group underwent thoracic exploration, pre-determined surgical lung biopsy, and peri-cardial window creation. Blood draws were ob-tained before surgery and at postoperative days 1, 3, and 14. Operative time, complications, laboratory parameters, hemodynamic parameters, and inflammatory parameters were compared between the two procedures. The animals were monitored for two weeks and necropsy was per-formed for surgical outcome evaluation.

Results: The thoracic procedures were successfully per-formed in all of the dogs, with the exception of one animal in the transoral group. There were no serious acute or delayed complications related to surgery. There was no difference between the two surgical groups for each of the hemodynamic parameters that were evaluated. Regarding the immunological impact of the surger-ies, transoral thoracostomy was associated with significant elevations in IL-6 and CRP levels when compared with the standard thoracoscopy. Transoral (n = 14) or standard thoracostomy was associated with significant elevations in IL-6 and CRP levels when compared with the standard thoracoscopy. Necropsy revealed absence of infection, no injury to vital organs, tinitis or thoracic infection. Necropsy revealed all dogs recovered well, without signs of medias-tinal infection.

18 NOTES-Cholecystectomy may be a viable alternative to conventional laparoscopic cholecystectomy: A systematic review and meta-analysis of the published comparative studies

Sajid MS, Ladvwa N, Leaver C, Singh KK, Sayegh M

Objective: The objective of this article was to sys-tematically analyse the published studies compar-ing the cholecystectomy by national orifice transluminal endoscopic surgery (NOTES-chole-cystectomy) versus conventional four port lar-paroscopic cholecystectomy (CLC).

Methods: The meta-analysis was conducted ac-cording to the Quality of Reporting of Meta-anal-y-sis (QUORUM) standards. Pubmed, Medline and Cochrane library databases were searched to re-trieve all types of published studies comparing the clinical and technical effectiveness of NOTES-cholecystectomy against CLC. The data from included studies was extracted and it was systemati-cally analysed using RevMan®. The summed outcomes were expressed as the odds ratios (OR) for dichotomous variables and standardised mean differences (SMD) for continuous variables.

Results: Eight published studies (one randomised trials, 3 non-randomised trials and 4 comparison cohorts) encompassing 527 patients were re-treived from the standard electronic databases. There were 234 patients in NOTES-cholecystect-omy group and 293 in CLC group. There was sig-nificant heterogeneity (Tau2 = 1.37; chi² = 103.75; df = 7; p = 0.0001; I² = 93%) among included stud-ies. Therefore, in the random effects model, op-erative time (SMD, 1.62; 95% CI, 0.74; 2.51; z = 3.60; p < 0.0003) for NOTES-cholecystectomy was shorter compared to CLC. In addition, the 24-hour postoperative pain score was lower (SMD, −0.98; 95% CI, −1.61, −0.35; z = 3.06; p < 0.002) and length of hospital stay was shorter (SMD, −0.37; 95% CI, −0.56, −0.18; z = 3.77; p < 0.0002) following NOTES-cholecystectomy. The risk of developing postoperative complications (OR, 0.53; 95% CI, 0.23, 1.29; z = 1.37; p = 0.17) and time to return to normal activities (SMD, −2.94; 95% CI, −6.96, −1.09; z = 1.43; p = 0.15) were statistically comparable between two tech-niques.

Conclusion: NOTES-cholecystectomy is a safe and technically feasible approach to treat gallstones with proven advantages of shorter operative time, shorter length of hospital stay and lesser postoperative pain. However, stronger evidence in the form of a major, multicentre randomised trial is required before considering the wider ap-plication of this approach for cholecystectomy.

19 Endoscopic transumbilical and transvaginal surgery using various types of flexible endo-scopes. Is there a future for this technology?


Background: Up to now there are no specialized flexible endoscopes to perform transumbilinal endo-surgery. Aim: To evaluate the capacity of various types of flexible endoscopes in order to reveal their bene-fits and disadvantages.

Methods: Since May 2007 up today 25 patients underwent cholecystectomies (23) and liver cysts fenestrations (2) using flexible endoscopes. Transvaginal (7) and transumbilical approach (18) were used. All procedures were performed by the same surgical team, there were no conver-sions, no intra/postoperative complications. In 7/ 25 cases we used the hybrid approach with the single access 2/5 mm port introduced at the right substernal region to perform gallbladder’s tractions and keep up the intra-abdominal pressure. Endo-scopic tools were used, passed through the oper-ating channel of endoscope. To perform the tech-nique we used single-channel endoscope Olympus GIF-Q160(3), high definition single-channel endoscope Olympus GIF-Q180H(3), double-chan-nel therapeutic endoscope Olympus GIF-2T160 (7), frontal optics ultrasound-endoscope with curved transducer and channel equipped by oper-ated elevator Pentax EG-3830UT(2) and Fujinon EG-530UT(6), along with Olympus R-scope(4).

The single-channel diagnostic endoscopes were pre-fused and adapted to a new medical problem and the underexposure of distant struc-tures, as well as bright areas in the centre and poorly illuminated areas in the periphery. Consis-tent illumination and sharp clear structures would help for orientation and to ensure safe opera-tion.

Methods and Procedures: In a collaborative re-search project with viamagic and C.R.S. iemotion (Villingen-Schwenningen) a new High-Dynamic-Range (HDR) Sensor is developed and adapted to medical problems and irritating effects occurring in minimally-invasive surgery. For this purpose, a first evaluation including different approaches for virtual smoke elimination was implemented by consulting 16 experienced endoscopists. More-over, the sensor is able to take three or more pic-tures of different exposure time simultaneously and fuses them to one optimized image in real-time. Due to the increased dynamic range com-pared to Standard-Dynamic-Range (SDR) cam-eras, more picture and colour information can be detected and utilized.

Results: HDR image processing provides high po-tential for medical application. The analysis of the evaluation provides the basis for further optimi-zation of the surgeon’s field of vision by the HDR camera system and dedicated software tools. The integrated image processing software improves interfering effects, such as reflections or smoke plumes of HF-devices. The HDR sensor is able to correct over- and underexposure and delivers an optimized image on the screen in real-time.

Conclusions: HDR imaging is a promising tool for improved visualization in medicine, but this tech-nique is in an initial stage for medical application. There are some aspects, which still have to be op-timized. One important challenge is colour ren-dering. In NOTES the natural colouring of human structures is an important feature for the physi-
cian to guarantee safety of the procedure. High-Dynamic-Range camera systems in medicine establish a helpful and promising technique also for NOTES interventions.

21 Feasibility and safety of endoscopic transumbilical thoracic surgical lung biopsy: A survival study in a canine model

Wei-Hsun Chen, Yen Chu, Chi-Ju Yeh, Chien-Ying Liu, Hsu-Chia Yuan, Po-Jen Ko, Yun-Hen Liu

Background: Post-thoracotomy discomfort is an unavoidable complication following thoracoscopic surgery. Transumbilical laparoscopy allows the patient to undergo various surgical procedures associated with abdominal diseases and prevents post-thoracotomy discomfort by avoiding the creation of an incision through the chest wall. The aim of this study was to evaluate the feasibility and safety of transumbilical thoracoscopic exploration and surgical lung biopsy in a canine survival model.

Methods: The procedure was performed in 12 dogs weighting 7.1 – 9.1 kg. The thoracic cavity was accessed transumbilically and diaphragmatic incisions. Following transumbilical thoracoscopy, the predetermined lung lobe was resected with an electrocautery loop. Clinical examinations, including determination of respiratory rate and rectal temperature, were carried out daily. Laboratory parameters (white blood cell [WBC] count and inflammatory parameters, including serum interleukin-6 (IL-6) and C-reactive protein [CRP] levels, were measured before surgery and at postoperative days 1, 3, 7, and 14. Necropsies were performed 2 weeks after surgery.

Results: Corrected surgical lung biopsies were performed successfully for the predetermined lung lobe in all animals, with a median time of 43.5 min (range, 32 – 65 min). Two peri-operative complications were observed: 1 dog suffered from minor postoperative air leakage, and 1 dog suffered from hemodynamic collapse due to inadequate ventilation. These animals recovered well without signs of peri-operative infection. Necropsies at 2 weeks after surgery showed no evidence of mediastinitis or peritonitis.

Conclusion: The thoracic cavity and surgical lung biopsy via a transumbilical incision is feasible and practical in this canine model of surgical lung biopsy via a transumbilical incision with a few five millimetre incisions and without complications. These animals recovered and were discharged on postoperative day 2. The transvaginal approach prolongs the post-operative recovery time when compared to a transabdominal laparoscopy.

22 Hybrid NOTES laparoscopic anterior resection in women and men

Sebastian Lamm, Andreas Zerz

Objective of the study: The NOTES hype of the last few years did not lead to any adoptions in daily routine with the exception of the hybrid NOTES cholecystectomy which has become a standard procedure in several institutions. In our opinion the rigid hybrid NOTES technique is the perfect tool to convert laparoscopically assisted operations into the NOTES laparoscopic procedures, avoiding the need of a minilaparotomy.

Methods and procedures: Although, in standard laparoscopy, we can usually perform the operation with a few five millimetres incisions and one ten millimetre trocar (for insertion of the Endoskope), there remains the need for a minilaparotomy for specimen removal. This lead to the idea of removing specimen through natural orifices, eliminating the need for a minilaparotomy. The transrectal pathway is a good alternative for retrieval of the specimen in men or in women with contraindications for a transvaginal route.

Results: In our experience after more than hundred transvaginal and transrectal laparoscopic anterior resections it is a safe and feasible method for daily routine.

Conclusions based on the results: In our opinion these techniques are the consequent evolution of the standard laparoscopic surgery in colorectal surgery. Combining standard laparoscopic operative techniques with specimen retrieval through natural orifices, eliminates the need for a minilaparotomy, allowing a totally laparoscopic operation without visible incision deep in the umbilicus, than we can achieve an optimal surgical comfort and an unproblematic triangulation during a NOTES cholecystectomy. The cosmetic outcome is still excellent. You can observe a moderate learning curve and the required operation time is only marginally prolonged in comparison to the CLC.

24 Covered self-expandable metal stents (sems) as a new treatment option for perforated duodenal ulcer

Jorge Alberto Arroyo -Vazquez, Per-Ola Park, Maria Bergström

Introduction: Surgical closure is the gold standard for treating perforated duodenal ulcers. Covered self-expandable metal stents (SEMS) allow an endoscopic treatment with no need for a minilaparotomy for treating anastomotic leakages. In analogy with this treatment we started to use covered SEMS to treat perforated duodenal ulcers.

Aims & methods: From 2009 to 2012 eight patients (age 62 to 87, six female, two male) with a perforated duodenal ulcer were treated with a covered duodenal SEMS at our surgical department. A covered Hanaro stent (through the scope) from M1 tech Korea was used. It was placed through the endoscope under fluoroscopic and endoscopic guidance. All patients presented with acute epigastric pain and a CT-scan showed intra-abdominal gas. The two first patients were primarily treated with open surgical closure, but due to continuous leakage endoscopic stenting was performed. The six following patients were treated with SEMS as primary treatment due to co-morbidities. Of these patients, one had a complicated ulcer disease with bleeding and had been treated with endovascular coiling previous to the perforation. Another patient who also had been treated with coiling developed a pyloric stenosis and perforated during dilatation. Abdominal drainage was placed percutaneously in four patients. The two patients who were primarily operated received a drainage-tube at the operation.

Results: The patients were treated with SEMS 1 to 36 days after presenting with epigastric pain. Six patients were checked with a CT-scan 1 – 6 days after stenting showing no leakages. One patient with dementia showed good recovery and was not checked for leakage. One patient, 87 years old, died 1 day after stenting. She was in a poor condition due to delayed diagnosis and treatment. In total seven patients recovered without further complications or treatments. All stents were removed endoscopically after a mean of 30 days. These patients are still alive after 6 – 52 months.

Conclusion: Covered metal stents can safely be used as a treatment for perforated duodenal ulcers. In the future, stent treatment might become a primary option together with percutaneous drainage as an alternative to surgery.

25 An analysis of endoscopy-assisted and laparoscopic intragastric endotherapy in an experimental model of gastric submucosal pseudocyst

Sánchez-Margallo FM, Pérez FJ, Sánchez MA

Objective: This study aimed to evaluate the feasibility and usefulness of the combination of flexible endoscopy and laparoscopy during minimal-
Invasive intragastric treatment of experimental submucosal pseudotumors located at the level of Z-line.

**Methods and procedures:** Six healthy female pigs underwent a transpapibular injection of sterile alginate at the level of Z-line area creating a model of gastric mucosal pseudotumor. The operative procedures included intragastric surgery with endoscopic vision (n = 3) and intragastric surgery with peritoneoscopy using a standard gastroscope; – perforation of peritoneal reflection; – peritoneal lavage can be carried out by positioning additional trocars: histological and cytological sampling, rectal perforation above the peritoneal reflection.

**Results:** The pseudotumors ranged in size from 3 to 6 cm in diameter. The access of the intragastric cavity was successfully performed in all animals without complications. The transgastric approaches were performed without any complication in all animals. More technical difficulties were encountered in the transgastric approach with endoscopic vision. The duration of the operations ranged from 70 to 130 mins. No complications were encountered in the postoperative follow-up. After one-month exploratory laparotomy not showed alterations in abdominal cavity.

**Conclusions:** This experiment showed the usefulness of porcine model for research in minimally invasive intragastric surgery. The application of transgastric endoscopic-assisted and laparoscopic surgery to submucosal pseudotumors of the stomach are technically feasible, safe and reproducible and may be a useful alternative to open surgery and endoscopic techniques. Additional studies will be necessary to establish the role of transgastric surgery in the treatment of gastric cancer.

**26 New ultrasound-guided culdotomy of vaginal ovarian cystectomy for pregnant women incarcerated ovarian dermoid cysts in recto-uterine pouch: case reports**

Satoshi Dohi, Masaaki Tanaka, Rena Yamazaki, Tetsuo Sagawa, Masaki Inoue

**Objective of the study:** For pregnant women with ovarian cysts, it’s important that pregnant uterus is gently treated in laparoscopic cystectomy. Especially the cases incarcerated in recto-uterine pouch are difficult to do laparoscopic ovarian cystectomy. Such cases are suitable for vaginal ovarian cystectomy, but it has severe complication, rectal injury. As a reliable method of transvaginal access, we introduce a new culdotomy procedure and reported two pregnant cases.

**Methods and procedures:** New culdotomy procedure uses a technique for the creation of space in the cul-de-sac, transvaginal ultrasound, and a newly developed umbrella Hakko needle. The umbrella Hakko needle consists of a 19-gauge, 30-cm long, metal needle with an overcoat.

**Results:** In both cases, culdotomy was performed successfully. There were no severe operative complications, rectal injury. Also, there were no blood transfusion, no severe hemorrhage, and no postoperative complications. Pregnancy course of both case were no problem, normal vaginal delivery.

**Conclusions based on the results:** Ultrasound-guided culdotomy of vaginal ovarian cystectomy for pregnant women incarcerated ovarian dermoid cysts in retro-uterine pouch is useful, minimally invasive surgery. It has potential applicability in transvaginal NOTES for pregnant women.

**27 Diagnostic flexible laparoscopy: A single incision procedure**

Lino Polese, MD and Stefano Meriglione, MD

**Objective of the study:** Diagnostic laparoscopy is a minimally invasive method of obtaining tissue samples of peritoneal organs. Simple additional procedures, such as histological or cytological sampling, fluid aspiration and intra-peritoneal lavage can be carried out by positioning additional trocars.

The aim of this technique is to reduce the number of percutaneous trocars required to complete the procedure, by using a flexible endoscope for this purpose.

**Methods and procedure:** After positioning a percutaneous 12 mm trocar and inducing CO2 pneumoperitoneum, a flexible endoscope was introduced through the trocar to inspect intra-abdominal organs. Simple procedures were performed utilizing the working channel of the endoscope.

**Results:** The procedure was performed in six patients for diagnosis of chronic abdominal pain or for tumor staging. No complications were reported after a median follow-up of 5 months. It was possible to inspect the intra-abdominal organs, including the surface of the liver, the gallbladder, the stomach, the intestine, the pelvic organs and the free intraperitoneal fluid. It was possible to perform simple procedures through the working channel, without positioning additional trocars: histological and cytological sampling, removal of simple adhesions, cyst puncture and intraperitoneal lavage.

**Conclusions based on the results:** Using a flexible endoscope through a single percutaneous trocar makes it possible to perform a diagnostic laparoscopy during which simple therapeutic and diagnostic procedures can be carried out with the same sterility and organ integrity as that provided by a standard laparoscopy.

**28 Transanal ileopectroctomy in a human cadaver**

Lino Polese, Emanuele Lezoche, Andrea Porzianoto, Giovanni Lezoche, Raffaiele De Caro, Stefano Meriglione, Lorenzo Nerborto

**Objective of the study:** The technical feasibility of ileorectal by-pass (ileopectroctomy), performed entirely through a transanal access, was previously evaluated and demonstrated in a porcine model. The aim of this study was to verify the technical feasibility of the same operation in a human cadaver.

**Methods and procedures:** The procedure was carried out in a human male cadaver. A Transanal Endoscopic Microsurgery (TEM) device and endoscopic instruments were utilized.

**Results:** The study demonstrates that ileorectal by-pass through a transanal access is technically feasible in humans. The principal steps of the procedure are:

- TEM device placement;
- rectal perforation above the peritoneal reflection;
- peritoneoscopy using a standard gastroscope;
- grasping the small bowel with retrieval forceps and pulling it through the rectal hole;
- suturing the ileum and the rectum together through the TEM device;
- opening the ileal loop followed by endoscopic exploration.

**Conclusions based on the results:** Ileorectal by-pass through a transanal access is technically feasible in humans and although still at an experimental stage, it could become a surgical option in the treatment of some types of colonic strictures.

**29 Endoscopic minimal invasive methods for drainage of pancreatic cysts and abscesses:**

Omar Al-Mukhtar, Bo Erlandsson, Maria Bergström, Per-Ola Park

**Objective of the study:** As an alternative to open surgery laparoscopic, endoscopic and interven- tional radiology has been developed to treat complications of acute pancreatitis. These methods carry less morbidity and mortality than open surgical treatment.

**Methods and procedures:** During a 3 year period 22 of 478 patients hospitalized with the diagnosis acute pancreatitis at the Department of Surgery, South Alvsborg Hospital, Borås, Sweden developed abscesses or symptomatic cysts.

**NOTES-technique:** With EUS the abcess/cyst was identified and punctured. After a guidewire the puncture hole was dilated with a 20 mm CRE-balloon. A therapeutic large channel gastroscopy was introduced into the cyst/abcess over the wire for cleaning and necrosectomy. Four 10 F pigtail stents were left in place between the cyst and gastric lumen to a month after.

**Percutaneous endoscopic technique:** The abcess was punctured with the help of external US and a guidewire was introduced. The chanel was dilated with a 20 mm CRE-balloon and a therapeutic large channel gastroscopy was introduced over the wire into the cyst/abcess for cleaning and necrosectomy. A 24 F drainage was left in place for drainage and further rinsing.

**Results:** Out of the 22 patients 10 with abscesses and 7 with cysts were treated with NOTES-technique and 2 were treated with percutaneous endoscopic technique. Two patients were laparotomy due to spontaneous perforation of the abcess into the transverse colon. One of these patients were later drained with NOTES-technique due to a secondary pseudocyst. One patient was excluded due to pancreatic cancer. Abscesses needed in median 1.5 (1–7) interventions while percutaneous drainage needed a median of 3 interventions (2–4). The patients were followed by CT-scans. All abscesses/cysts drained with minimally invasive techniques healed without need of surgery.

**Conclusions:** One patient died later due to heart failure, one drainie migrated into the cyst and was not possible to remove.

**Conclusions:** Pancreatic abscesses and cysts can safely be drained with endoscopic techniques (NOTES or percutaneous) with low morbidity and mortality.

**30 Covered stent placement is a treatment option for anastomotic leakage after gastric bypass surgery**

Jorge Alberto Arroyo-Vázquez, Sari Karhu, Maria Bergström, Per-Ola Park

**Introduction:** One of the most feared complications after Laparoscopic Gastric Bypass (LGBP) surgery is leakage of the gastro-entero anastomosis, often leading to re-operation with high morbidity and mortality. Endoscopic treatment of the leaks was diagnosed on post-op 2–3 days. One patient presented with leakage eight days after surgery. All patients were endoscopically treated with a stent within 12 hours after confirmed leakage. (Wallflex, partially covered, 23/28 × 125 mm). In
four of the patients a diagnostic laparoscopy was performed for drainage. During the procedure a gastroscopy was performed and the patient was placed under laparoscopic control. In one patient leakage was diagnosed during the LGBP and the procedure was converted to open surgery. To secure the resutured anastomosis a stent was placed endoscopically. An abdominal drainage was also placed. In all patients leakage was tested with methylene blue 0–1 day after stenting. The first patient was allowed oral intake after 4 days. The following 4 patients were allowed immediate oral intake after leakage test. Results: No patient showed signs of leakage after stenting. During stenting patient number 3 had a pneumothorax, probably caused by the gastroscopy. He was treated with an additional stent and a chest tube. Three patients needed intensive care (2, 3, 30 days). The stents were changed in two patients after 22 and 26 days, these stents were finally removed after 14 respectively 16 days. The other three stents were removed after 15, 19 and 76 days. Hospital stay was 13 days (median). Three patients without further complications had a hospital stay of 9, 11 and 13 days. Two patients with additional complications, pulmonary embolism and pneumothorax, had a hospital stay of 30 and 42 days. Stent related complications were one stent migration (endoscopically removed) and one minor bleeding.

Conclusion: Stent treatment of anastomotic leakage after LGBP is safe and efficient and allows early oral intake.

31 Trans-gastric pancreatic necrosectomy via fully covered esophageal stent placed by a novel rendezvous technique: A never before described technique
Nikut Sonpal MD, Patrick Saitta MD, Gregory B. Haber MD

Patients with acute pancreatitis can develop necrosis and the removal of dead tissue is critical. Typically this debridement is done surgically but it can also be accomplished by EUS-guided endoscopic trans-gastric-necrosectomy (EUS-ETGN). A 53-year-old male developed acute pancreatic necrosis secondary to alcohol consumption. A repeat CT scan at 6 weeks revealed persistent pancreatic necrosis and he continued to have bacteremia. The patient was referred for endoscopic debridement. A linear-echo-endoscope revealed a large hypoechoic collection with mixed echogenicity. The collection was accessed using a 19-gauge needle. A 0.035 guidewire was advanced into the cavity under fluoroscopic guidance and the wire coiled inside what appeared to be a mature cavity. Contrast was injected into the cavity further confirming correct placement of the wire in the cavity of necrosis. The fistula tract was dilated from 6 mm to 12 mm using a through-the-scope balloon and a large release of purulent material confirmed placement. However due to the acute angulation of the gastro-peritoneal fistula, endoscopic access to the necrotic area was not possible. At this time two 10 fr × 5 cm double pig-tail stents were placed. Then during a second procedure a novel access approach was employed. A guidewire was introduced into the fistula tract and advanced into the necrotic cavity. A mini-snares was then advanced through the external drain into the cavity of necrosis. Then using a tandem cannulation catheter the wire was advanced into the snare. This rendezvous technique was then successfully used to carry the wire out through the external drain and with traction on the wire, we were successfully able to deploy an 18 mm × 6 cm fully covered stent through the cyst gastrotomy tract under direct endoscopic and fluoroscopic guidance. This facilitated access to the cavity allowing for subsequent debridement of necrosis. After complete debridement of the cavity, the covered stent was removed and again two pigtail stents were left in its place. EUS-ETGN of infected necrosis in acute pancreatitis appears to be safer treatment option. This novel technique describes how access to the retroperitoneum can be accomplished in the face of difficulty angulation and orientation.

32 Initial experience of glove port technique in single incision laparoscopic cholecystectomy using conventional laparoscopic instruments
Abdelaziz Hassan AM, Mahmoud M, Helmy AH

Introduction: Single-incision laparoscopic surgery is an attractive approach for cholecystectomy. However, its widespread application has many limitations. A significant obstacle of application in developing countries is the expensive and non-affordable specialized single port systems and rotulating instruments. Objective: To evaluate our initial experience of single incision laparoscopic cholecystectomy (SILC) performed by a single surgeon using the glove port technique and the conventional laparoscopic instruments.

Methodology: 45 patients with symptomatic gall bladder stone disease underwent an elective SILC during the period from October 2011 to March 2012 at Theodor Bilharz Research Institute. Trans-umbilical single incision glove port access was used. Patient’s demographic data, perioperative outcomes, and early postoperative complications were collected and analyzed.

Results: The mean operative time was 47.75 min and the mean estimated blood loss was 14.5 ml. Intraoperative bile leakage due to gall bladder perforation occurred in 4 cases (8.89%). Troublesome cystic artery bleeding occurred in 2 cases (4.44%). An intra-operative trans cholecystic cholangiogram was performed in 2 cases and a drain was inserted in 3 cases (6.66%). No conversion of the technique occurred except in one case (2.22%) at which additional 5 ml port was used. 41 patients (91.11%) discharged in the first post-operative day and 4 patients in the 2nd day. Post-operative wound seroma was observed in 2 cases and subumbilical wound hematoma in one case. Three months post-operative wound length was an average of 1.59 cm while patient satisfaction of the surgery was an average of 9.41. Conclusion: On preselected cases; glove port laparoscopic cholecystectomy (GPLC) using the conventional laparoscopic instruments is feasible and safe with excellent aesthetic results and high grade of patient satisfaction. We consider GPLC a cost effective and convenient alternative to single port laparoscopic cholecystectomy and its scale of application could be widened once enough experience is attained.