



Gastroenterology

Contents

Contents of the folder

85160-100	Leaflet VIO 3
85135-100	Leaflet APC 3
85110-108	Flyer Ablation of barrett's esophagus with HybridAPC
85110-118	Flyer Waterjet elevation prior to ESD or EMR
85800-131	User brochure gastroenterology
85110-122	Flyer information channels
85820-084	USB card gastroenterology

Files on the USB card

Product information

85140-190	Leaflet VIO product family
85160-100	Leaflet VIO 3
85150-100	Leaflet ERBEJET 2
85134-100	Leaflet APC
85135-100	Leaflet APC 3
85100-186	Leaflet APCapplicator
85325-100	Leaflet EIP 2
85100-158	Leaflet HybridKnife
85100-140	Leaflet FiAPC

Application information

85800-131	User brochure gastroenterology
85110-116	Checklist safe monopolar electrosurgery
85110-118	Flyer Waterjet elevation prior to ESD or EMR
85110-107	POEM – Peroral endoscopic myotomy using HybridKnife
85110-108	Ablation of Barrett's esophagus with HybridAPC
85800-117	Endo CUT Q
85800-119	Endo CUT I
85110-122	Flyer information channels
eBook Pocket Guide Electrosurgery	https://de.erbe-med.com/de-en/education/modules/detail/pocket-guide-gastroenterology/

Further information, URLs

Erbe Website	www.erbe-med.com
Erbeplus academy / Further education	https://de.erbe-med.com/de-de/fortbildung/
Videos on gastroenterology	www.medical-video.com
Apps of Erbe Elektromedizin GmbH in the Apple App store	https://itunes.apple.com/de/developer/erbe-elektromedizin-gmbh/id642728983



Publication review

Erbe technology in gastroenterology

FUNDAMENTALS

A. Neugebauer, M. Zenker, M. D. Enderle. Grundlagen der Hochfrequenz-Chirurgie, Endo heute 2012; 25(1): 8-13.

Synopsis: Electrosurgery is the application of a high-frequency electrical current to biological tissue with the aim of generating a thermal effect that offers medical benefits. This technique is used in numerous procedures and has become an integral part of modern medicine.

The fundamentals of electrosurgery are illustrated in simple and comprehensible fashion. The aim is to provide an overview as well as assistance for medical personnel who work with electrosurgery on a daily basis.

A. Repici, M. D. Enderle, A. Neugebauer, H. Manner, A. Eickhoff. Grundlagen der Hochfrequenz-Chirurgie: Teil 2: Anwendungen in der Endoskopie Endo heute 2012; 25(4): 225-234

Synopsis: All members of staff working in endoscopy should have basic knowledge of electrosurgery. This article explains the most important application areas of electrosurgery in clear and systematic fashion.

Pimentel-Nunes P, Dinis-Ribeiro, Ponchon T, Repici A, Vieth M, De Ceglie A, Amato A, Berr F, Bhandari P, Bialek A, Conio M, Haringsma J, Langner C, Meisner S, Messmann H, Morino M, Neuhaus H, Piessevaux H, Rugge M, Saunders BP, Robaszekiewicz M, Seewald S, Kashin S, Dumonceau JM, Hassan C, Deprez PH. Endoscopic submucosal dissection: European Society of Gastrointestinal Endoscopy, (ESGE) Guideline. Endoscopy. 2015 Sep;47(9):829-54.

Synopsis: ESGE guideline that discusses in particular the benefits and disadvantages of ESD and EMR. The indications for ESD and EMR that are currently applicable are specified together with recommendations for use in each case.

J. F. Rey, U. Beilenhoff, C.S. Neumann, J. M. Dumonceau. European Society of Gastrointestinal Endoscopy (ESGE) guideline: the use of electro-surgical units. Endoscopy. 2010 Sep; 42(9):764-72.

Synopsis: ESGE guideline in which, amongst other things, ESD and EMR are discussed in terms of application with ESUs. The authors consider ENDOCUT mode and intermittent mode to be the usual settings to be used in this case. In comparison with EMR, ESD is technically more demanding and time-consuming, however it facilitates en-bloc resection in most cases.

POEM USING HYBRIDKNIFE®

Stavropoulos SN, Modayil R, Friedel D. Per oral endoscopic myotomy for the treatment of achalasia. Curr Opin Gastroenterol. 2015 Sep;31(5):430-40.

Synopsis: A review was carried out of the latest literature on POEM since the last two comprehensive analyses [Natural Orifice Surgery Consortium for Assessment and Research (NOSCAR) white paper, ASGE Preservation and Incorporation of Valuable endoscopic Innovations (PIVI)], with integration of these findings into the POEM guidelines.

These current studies are largely based on the learning curve of POEM

surgeons, the comparison of POEM with laparoscopic Heller myotomy (LHM) and extended POEM applications.

Result: POEM and LHM are comparable with regard to effectiveness (reduced dysphagia and Eckardt score) and complications, including GERD. POEM was successfully carried out in numerous patients including children (with prior treatment for achalasia as well as those with spastic disorders of the esophagus).

Conclusion of the authors: POEM was validated as a treatment for achalasia. Questions remain with regard to long-term effectiveness in comparison with LHM (laparoscopic Heller myotomy).

Li QL, Zhou PH. Perspective on peroral endoscopic myotomy for achalasia: Zhongshan experience. Gut Liver. 2015 Mar; 9(2):152-8.

Synopsis: Article that provides a review of POEM (peroral endoscopic myotomy) at Zhongshan hospital, Fudan University, China. In addition to other techniques, the waterjet exposure technique was introduced with the aim of simplifying the procedure and improving remission rates.

Conclusion of the authors: POEM is considered a safe and effective treatment option for achalasia, however prospective multicenter studies are deemed necessary in order to demonstrate clinical efficiency.

Toerner T, Charton J P, Neuhaus H: POEM- Erste klinische Erfahrungen nach Einführung der neuen Methode zur Behandlung der Achalasie, Endo-Praxis 2014; 30(1):18-22.

Conclusion of the authors: POEM is a new, minimally-invasive option for the treatment of achalasia that should currently still only be carried out in specialized centers with extensive experience in interventional endoscopy. Initial reproducible results indicate a high therapeutic success rate as well as a low rate of complication. However, this must be qualified at this time by noting that long-term data is not yet available, for example also with regard to the occurrence of reflux disease. There is also just as little data up until now from prospective studies for comparison of POEM with other endoscopic or surgical treatment procedures. It would be helpful if previously untreated patients in the centers were to be included in corresponding studies.

Cai MY, Zhou PH, Yao LQ, Xu MD, Zhong YS, Li QL, Chen WF, Hu JW, Cui Z, Zhu BQ. Peroral endoscopic myotomy for idiopathic achalasia: randomized comparison of water-jet assisted versus conventional dissection technique. Surg Endosc. 2014 Apr;28(4):1158-65.

Synopsis: In this POEM study of 100 patients, the effectiveness and safety of HybridKnife (HK) was compared with the conventional technique. Benefits of HybridKnife: surgical time was significantly shorter, mainly due to fewer instrument changes; less light bleeding, total operative time: (22.9 ± 6.7 vs. 35.9 ± 11.7 min; p < 0.0001), time for instrument changes: (2.0 ± 2.4 vs. 19.2 ± 7.6 min.; p < 0.0001), light bleeding: (3.6 ± 1.8 vs. 6.8 ± 5.2; p < 0.0001). There were no serious complications. Additional complications: HK: no subcutaneous emphysema vs. 4 incidences of subcutaneous emphysema with the conventional technique. (p = 0.17), no pneumonia vs. 3 cases with the conventional technique (p = 0.24). Success of treatment evaluated in accordance with the Eckardt score: ≤3 for 96.5% of the patients in both groups. Conclusion of the authors: With HybridKnife, POEM could be carried out

more quickly, with easier submucosal injection and fewer incidences of light bleeding.

Inoue H, Minami H, Kobayashi Y, Sato Y, Kaga M, Suzuki M, Satodate H, Odaka N, Itoh H, Kudo S. Peroral endoscopic myotomy (POEM) for esophageal achalasia, *Endoscopy* 2010 Vol 42: 265-271.

Synopsis: Prospective study of 17 patients with achalasia.

Result: In all patients, POEM reduces the dysphagia symptom score as well as the pressure at rest in the lower esophageal sphincter. No severe complications were observed in connection with POEM.

Conclusion of the authors: The short-term results of POEM were excellent for achalasia.

Zhou PH, Li QL, Yao LQ, Xu MD, Chen WF, Cai MY, Hu JW, Li L, Zhang YQ, Zhong YS, Ma LL, Qin WZ, Cui Z. Peroral endoscopic remyotomy for failed Heller myotomy: a prospective single-center study. *Endoscopy*. 2013; 45(3):161-6.

Synopsis: Study of 12 patients following Heller myotomy. The primary goal was to alleviate symptoms during the follow-up period.

Result: No severe complications were observed in connection with POEM. While the mean follow-up period was 10.4 months (5-14 months), successful treatment was achieved for 11/12 patients.

Conclusion of the authors: After failure of Heller myotomy, POEM appears to be a highly-promising new form of treatment that leads to short-term alleviation of symptoms in >90% of cases.

ESD USING HYBRIDKNIFE®

Jacques J, Sautereau D, Carrier P, Couquet CY, Debette-Gratien M, Le-Sidaner A, Tabouret T, Valgueblasse V, Loustaud-Ratti V, Legros R. High-pressure injection of glycerol with HybridKnife for ESD is feasible and increases the ease and speed of the procedure: an in vivo study in pigs and first use in human. *Surg Endosc*. 2015 Nov; 29(11):3382-5

Synopsis: In small porcine and in human stomachs (antrum and corpus), submucosal injection with glycerol was investigated in comparison with 0.9% NaCl for suitability in ESD with HybridKnife.

Result: No differences were apparent between the solutions with regard to perforation, bleeding and R0 resection. Dissection was significantly faster when glycerol was used for submucosal injection (27.44 vs. 16.44 mm²/min; $p < 0.001$). Surgeons judged safety and user-friendliness using a dissection score based on a visual analog scale: in the case of dissection using glycerol, the dissection score was significantly higher (5.9 vs. 2.9; $p < 0.001$).

Conclusion of the authors: in the case of ESD, submucosal injection using glycerol with HybridKnife is feasible and increases the safety and speed of the procedure in comparison with a normal 0.9% NaCl solution.

Ping-Hong Zhou, Brigitte Schumacher, Li-Qing Yao, Mei-Dong Xu, Thomas Nordmann, Ming-Yan Cai, Jean-Pierre Charton, Michael Vieth, Horst Neuhaus. Conventional vs. water-jet-assisted endoscopic submucosal dissection in early gastric cancer: a randomized controlled trial. *Endoscopy* 2014;46;836-842.

Synopsis: Randomized controlled study of ESD in early gastric neoplasia (adenomas and adenocarcinomas) with HybridKnife in comparison with the conventional technique.

Result: No significant differences in terms of the size of the lesions, R0 resection rates, perforations, late bleeding, full remission rate of neoplasia at 3-month follow-up. With HybridKnife, the procedure can be completed considerably more quickly: (27.5 ± 30.6 vs. 35.0 ± 22.5

minutes, $p = 0.0008$).

Conclusion of the authors: ESD of gastric neoplasia using HybridKnife is effective and safe, faster and easier than in comparison with conventional ESD.

Repici A, Hassan C, Pagano N, Rando G, Romeo F, Spaggiari P, Roncalli M, Ferrara E, Malesci A. High efficacy of endoscopic submucosal dissection forectal laterally spreading tumors larger than 3 cm. *Gastrointest Endosc*. 2013 Jan; 77(1):96-101.

Synopsis: Prospective, single-arm pilot study of ESD in lateral spreading tumors (LSTs) in the colon and rectum (larger than 3 cm) using waterjet submucosal injection in 40 patients. Result: Mean size of the lesions: 8 ± 10.9 cm (33-80 mm). Time: 86.1 ± 35.5 minutes (40-190 min), en-bloc resection rate: 90% (36/40), curative resection rate (R0) = 80% (32 of 40 LSTs), perforations: 2.5% (1 patient), these could be treated conservatively, post-operative bleeding = 5% (2 patients), this could be staunched endoscopically.

Conclusion of the authors: ESD is safe and effective for en-bloc and curative resection of large lateral spreading tumors in the colon and rectum. The operative times and complications are considered comparable with published data from specialized centers in Japan.

Schumacher B, Charton JP, Nordmann T, Vieth M, Enderle MD, Neuhaus H. Endoscopic submucosal dissection of early gastric neoplasia with a waterjet assisted Hybrid-Knife: a Western single center experience, *Gastrointest Endosc* 2012, Jun;75(6):1166-74.

Synopsis: The goal of this prospective, monocentric study of 29 patients was to evaluate the effectiveness and safety of ESD performed using HybridKnife in the case of gastric neoplasia. Study goals: complete resection rate, time, complication rate and recurrence rate. Result: En-bloc resection rate (endoscopic): 90%, R0 resection (histologically confirmed): 18 out of 28 patients (64.3%), mean operative duration: 74 minutes (15-402 minutes), number of instrument changes required = 10, as a result of heavy bleeding that had to be staunched using forceps, 30-day morbidity: 4/30 (13.8%) postoperative pain: 3 patients, late bleeding: 1 patient, death of one 93-year-old patient: no indication of a connection with the surgery. Complete local remission of neoplasia: 25/28 patients (89.3%) at a follow-up of 22 months (6-44 months). In one patient, a metachromatic gastric adenocarcinoma was diagnosed after 54 weeks following initial waterjet treatment.

Conclusion of the authors: The technique is deemed to make ESD easier and is considered effective and safe.

Repici, A et al.: A prospective, single center study of endoscopic submucosal dissection of rectal LST lesion larger than 3cm by using an innovative concept of injecting and Cutting: The water-Jet Hybrid-Knife (ESD-H). *Gastrointest Endosc* Vol 73, Issue 4, Supplement, Page AB156, April 2011.

Synopsis: Prospective pilot study. 40 patients with rectal LST lesions > 3 cm.

Result: En-bloc resection rate was 34/40 (85%). The curative R0 rate was 32/40 (80%). Average operative time was 112 min (84-166 min).

Conclusion of the authors: ESD in connection with HybridKnife is a safe and effective method for patients with large LST lesions of the rectum (for en-bloc and curative treatment). The operative time and complication rates are comparable with earlier data published by Japanese experts.

Neuhaus, H: Endoscopic mucosal resection and endoscopic submucosal dissection in the West –too many concerns and caveats? *Endoscopy* 2010; 42: 859-861.

Review article on EMR and ESD

Conclusion of the author: The volume of evidence to demonstrate the su-

periority of ESD versus EMR with regard to the clinical results is currently still limited. However, ESD could become the method of choice for local treatment of neoplasia in Western countries due to the potential benefits, assuming that the procedure can be simplified and safety improved. This goal can be achieved through technical improvements and structured training of surgeons.

Horst Neuhaus, Rupert Mayershofer, Katja Wirths, Brigitte Schumacher, Alexander Seelhoff, Michael Vieth, Markus D. Enderle. First Clinical Trial of Endoscopic Submucosal Resection (ESD) of Early Gastric Neoplasia with a Water-Jet Hybridknife (ESDH). *Gastrointestinal Endoscopy*, Vol. 69, Issue 5, AB259

Synopsis: Study of 13 patients. The primary goal was complete resection of defined lesions in early gastric neoplasia. Result: En-bloc resection of the target lesion could be carried out in all cases. The average operative time was 85.5 min (55-180 min).

Conclusion of the authors: ESDH (endoscopic submucosal dissection using waterjet HybridKnife) is feasible and simplifies the procedure as fewer instrument changes are required.

The easy reproducibility of needle-free submucosal injections using a physiological saline solution can accelerate procedures without the need for special solutions.

These initial clinical results show that ESDH is a highly-promising new ESD technique for complete and safe en-bloc resection of early gastric neoplasia.

ENDOSCOPIC RESECTION OF SUBMUCOSAL TUMORS (STER)

Xu MD, Yao LQ, Zhou PH, Li QL, Cai MY, Zhong YS, Chen WF, Zhang YQ, Ma LL, Qin WZ, Hu JW, Ren Z, Chen SY. Advantages of Submucosal Tunneling Endoscopic Resection (STER) with HybridKnife® over Conventional Electric Knife for Upper Gastrointestinal Submucosal Tumors Origination from Muscularis Propria Layer: a prospective study. *Gastrointest Endosc* April 2012, Volume 75, Issue 4, Supplement, Page AB133.

Synopsis: Prospective, randomized, controlled study of 31 patients with submucosal tumors of the upper GI tract. HybridKnife vs. conventional electric knife.

Result: All tumors were resected en-bloc and the R0 rate was 100%. The operative time with HybridKnife was significantly shorter (50.5 ± 18.3 min vs. 78.7 ± 21.2 min). The number of incidences of intraoperative bleeding was also lower (3.63 ± 1.29 vs. 6.10 ± 4.24).

Conclusion of the authors: In comparison with the conventional electric knife, waterjet STER surgery using HybridKnife is more convenient and safer as a result of considerably fewer instrument changes and a much lower incidence of intraoperative bleeding. All indications would suggest that HybridKnife can be a realistic alternative in terms of speed and handling during STER.

Xu MD et al.: Submucosal tunneling endoscopic resection: a new technique for treating upper GI submucosal tumors originating from the muscularis propria layer (with videos). *Gastrointestinal Endoscopy* Volume 75, No.1: 2012.

Synopsis: Prospective study of 15 patients with submucosal tumors of the upper GI tract who were treated using STER. Result: STER was carried out successfully in all cases. The en-bloc resection rate was 100%. The average lesion size was 1.9 cm (1.2-3.0 cm). The average operative time was 78.7 min (25-130 min).

Conclusion of the authors: To summarize, STER is a safe and easily-implementable method for providing histopathological assessments as

well as for radical treatment of SMTs.

STAUENING OF BLEEDING WITH APC 2

Lenz L, Tafarel J, Correia L, Bonilha D, Santos M, Rodrigues R, Gomes G, Andrade G, Martins F, Monaghan M, Nakao F, Libera E, Ferrari AP, Rohr R. Comparative study of bipolar electrocoagulation versus argon plasma coagulation for rectal bleeding due to chronic radiation coloproctopathy. *Endoscopy*. 2011 Aug; 43(8):697-701.

Synopsis: Comparative study of the treatment of chronic rectal bleeding following radiotherapy using argon-plasma coagulation and bipolar electrocauterization (15 patients per group). Both methods were successful in stopping rectal bleeding, and after 6 months, a significant increase in hemoglobin levels was recorded (success rate = 86%, no significant difference between the methods). In the case of argon-plasma coagulation, there were fewer complications (33.3% vs. 66.7% with few complications or 6.7% vs. 33.3% with serious complications).

Eickhoff A, Enderle MD, Hartmann D, Eickhoff JC, Riemann JF, Jakobs R. Effectiveness and safety of PRECISE APC for the treatment of bleeding gastrointestinal angiodysplasia - a retrospective evaluation, *Z Gastroenterol*. 2011 Feb;49(2):195-200.

Synopsis: Evaluation of APC "PRECISE mode" in the treatment of angiodysplasia in the cecum and/or small intestine. In total, all 234 lesions in the 94 patients included in the study were successfully coagulated. Perforations, bleeding or tissue carbonization could not be determined following application. 19% of the patients suffered subsequent bleeding, with tumors recurring in 16% of the patients. According to the authors, the study shows "that PRECISE mode appears to be suitable for the treatment of angiodysplasia in the critical small-intestine area of the cecum and of the small intestine."

ABLATION OF BARRETT'S ESOPHAGUS WITH HYBRIDAPC

Manner H, May A, Kouti I, Pech O, Vieth M, Ell C. Efficacy and safety of Hybrid-APC for the ablation of Barrett's esophagus. *Surg Endosc*. 2015 Jun 24.

Synopsis: Prospective study of 60 patients with Barrett's esophagus, of which 50 patients were in fact included.

Result: 48 of 50 patients (96%; ITT: 49/60, 82%) achieved macroscopic complete remission with a median of 3.5 APC sessions.

Conclusion of the authors: The safety and effectiveness of HybridAPC was investigated on 50 patients with Barrett's esophagus. In addition, a transparent cap was also used as an attachment on the endoscope. HybridAPC was shown to be effective and safe in the treatment of Barrett's esophagus. The stricture formation rate was only 2%.

Sturm C, Eickhoff A, Manner H. Hybrid-Argon-Plasmakoagulation zur Behandlung des Barrett-Ösophagus und mukosaler Schleimhautläsionen, *Der Gastroenterologe* 2015/6:322-32.

Synopsis: Review article on APC and HybridAPC technology. Result: After 3 months, macroscopic complete ablation could be achieved using HybridAPC in 96% of the 60 patients in a study. Histologically complete Barrett ablation could be achieved in 78% of the patients.

Conclusion of the authors: HybridAPC is a combination of two established electrosurgical techniques for improving the effectiveness of ablation. Known side-effects are significantly reduced as a result of HybridAPC.

Manner H, Neugebauer A, Scharpf M, Braun K, May A, Ell C, Fend F, Enderle M. The tissue effect of argon-plasma coagulation with prior submucosal injection (Hybrid-APC) versus standard APC: a randomized ex-vivo study, *United European Gastroenterol J.* 2014 Oct;2(5):383-90

Synopsis: Ex vivo study in a porcine esophagus model with prospective, randomized study design for comparison of standard APC vs. HybridAPC with submucosal injection. An investigation was carried out of the penetration depth and damage to the submucosa / L. muscularis propria without submucosal injection using the standard probe, and with submucosal injection using the HybridAPC probe.

Result: The penetration depth of the coagulation effect of standard APC and HybridAPC was not significantly different at 50 W, however at 70 W, it was significant. The submucosa is more severely damaged when the standard APC probe is used in comparison with HybridAPC. In the specimens, the L. propria muscularis was only damaged when the standard probe was used: 50 W: (1/6); 70 W (6/6).

Conclusion of the authors: When the HybridAPC probe is used, the penetration depth of the coagulation effect is reduced. The L. propria muscularis is not damaged. Devices, instruments, settings: APC 2, flexible APC probe (20132-156) pulsed APC, effect 2, 50/70 W, gas flow: 0.9 l/min.

Manner H, Rabenstein T, Pech O, Braun K, May A, Pohl J, Behrens A, Vieth M, Ell C. Ablation of residual Barrett's epithelium after endoscopic resection: a randomized long-term follow-up study of argon plasma coagulation vs. surveillance (APE study). *Endoscopy.* 2014 Jan;46(1):6-12.

Synopsis: Patients were randomized following resection of focal Barrett's esophagus neoplasia (HGIN) or mucosa carcinomas, and either treated using APC or subject to endoscopic observation. Both patient groups received proton-pump inhibitors. Study goal: Neoplasia recurrence rate, number of patients = 63, follow-up: 2 years. Result: APC = 3% (1 patient) vs. endoscopic observation = 36.7% (11 patients) with neoplasia during the follow-up period.

Conclusion of the authors: In comparison with endoscopic observation, thermal ablation of residual Barrett's esophagus leads to a significant reduction in the neoplasia recurrence rate during the course of a limited follow-up period of 2 years.

Devices, settings, instruments: VIO 300 D, APC2, flexible 2.3 mm probe, power: pulsed APC, effect 2, 60 W, gas flow: 1.0 l/min.

Manner H, Kouti I, May A, Pech O, Behrens A, Vieth M, Ell C. Die neue Technik der Unterspritzungs-APC (i-APC) zur Ablation des Barrettösophagus: Zwischenergebnisse der Pilotserie; *Z Gastroenterol* 2013; 51 - K239.

Synopsis: Conference submission, report on a clinical pilot study of 60 patients.

Result: In 36/55 patients, ablation was completed following a mean of 3.4 APC sessions (1-10). It was possible to record the 3-month follow-up for 17 patients so far. Histologically residual Barrett's esophagus was evident in 2/17 patients, with the result that complete Barrett ablation could be achieved in 88% of the patients.

Conclusion of the authors: Based on the interim analysis of the pilot series, i-APC (HybridAPC) was shown to be effective and safe in the ablation of Barrett's esophagus. The rate of treatment-emergent esophageal stenosis was 0%. As a result, this rate was less than the level shown by previously established ablation techniques.

Kim KY, Jeon SW, Yang HM, Lee YR, Kang EJ, Lee HS, Kim SK. Clinical outcomes of argon plasma coagulation therapy for early gastric neoplasms. *Clin Endosc.* 2015 Mar;48(2):147-51.

Synopsis: Patient study (28 patients) investigating the clinical effectiveness, safety and local recurrence rate in APC treatment of early gastric neoplasia. Results: Complications: perforations, bleeding and infection = 0; tumor recurrence = 25%; Follow-up: 24.8 months (2 to 78 months).

Conclusion of the authors: Safety profile of the methods: beneficial, however additional long-term studies on this method of treatment are deemed necessary.

G.F. Kähler, M.N. Szyrach, A. Hieronymus, R. Grobholz, M.D. Enderle. Investigation of the thermal tissue effects of the argon plasma coagulation modes „pulsed“ and „precise“ on the porcine esophagus, ex vivo and in vivo. *Gastrointest Endosc* 2009; 70:362-8.

Synopsis: The goal of this study is to compare the effects on tissue of pulsed effect 2 and precise APC mode. Ex vivo and in vivo animal model. This study comprised 3 explanted porcine esophagi and 8 live pigs under general anesthetic. Result: In vivo, a well-known type of surface tissue damage of the tunica mucosa (type A) and a new type of tissue damage limited to the tunica muscularis (type B) were detected. Ex vivo, only type A damage was visible. Thermal damage of the tunica muscularis was significantly lower with precise APC in comparison with pulsed APC in vivo. Pulsed effect 2 demonstrated a positive correlation between the penetration depth and power ($r = 0.38$, $p < 0.0002$) or application time for which the highest power setting was used (40 W, $r = 0.77$, $p < .0001$). This connection could not be demonstrated with precise APC due to its highly-superficial tissue effect.

Conclusion of the authors: Thermal damage to the esophageal tunica muscularis as a result of APC appears to be underestimated ex vivo. The scale of tissue damage was significantly lower with precise APC than with pulsed APC, which indicates that precise APC is particularly suited to the treatment of thermosensitive, thin-walled structures.

H. Manner, M.D. Enderle, O. Pech, A. May, N. Plum, J.F. Riemann, C. Ell, A. Eickhoff. Second-generation argon plasma coagulation: Two-center experience with 600 patients. *Journal of Gastroenterology and Hepatology* 2008; 23:872-878.

Conclusion of the authors: Retrospective investigation of the safety and effectiveness of APC 2/VIO APC with the application modes FORCE, PULSED AND PRECISE that have been extended in comparison with the previous model. 4 studies (600 patients) on the endoscopic treatment of gastrointestinal disorders were retrospectively evaluated. Minor complications were observed in 9-21% of the patients, serious complications in 1-7% of the patients. In comparison with PRECISE mode, PULSED and FORCED APC mode were reported to have shown a 50% higher tissue effect that would have to be taken into consideration. According to the authors, the use of the extended application modes is safe and effective when this fact is taken into consideration.

A. Eickhoff, R. Jakobs, D. Schilling, D. Hartmann, U. Weickert, MD Enderle, JC Eickhoff, JF Riemann. Prospective non randomized comparison of two modes of argon beamer (APC) tumor desobstruction: effectiveness of the new pulsed APC versus forced APC. *Endoscopy* 2007; 39:637-42.

Conclusion of the authors: Prospective, non-randomized study of the effectiveness of the argon-plasma coagulation modes "PULSED" (46 patients) and "FORCED" (54 patients) in the endoscopic ablation of local obstructive tumors in the gastrointestinal tract. The ablation and

reduction of the tumor mass using both methods was around 85%. There were no serious complications such as, for example, perforations, abdominal abscesses, mediastinitis or fistulas. Using "FORCED" mode, tumors could be ablated more quickly. The authors describe the methods as effective, safe, fast and inexpensive.

TREATMENT OF VASCULAR MALFORMATIONS - GAVE SYNDROME

Boltin D, Gingold-Belfer R, Lichtenstein L, Levi Z, Niv Y. Long-term treatment outcome of patients with gastric vascular ectasia treated with argon plasma coagulation. Eur J Gastroenterol Hepatol. 2014 Jun;26(6):588-93.

Synopsis: Retrospective study investigating the effectiveness of APC in the treatment of gastric vascular ectasia (GAVE). (n = 62 patients), average age: 72.6 ± 12.8 years, follow-up period: 46.9 ± 26.5 months. Success rate: 16 patients (25.8%).

Conclusion of the authors: APC is safe and effective in the initial treatment of gastric vascular ectasia, however it does not provide a long-term remedy for bleeding and anemia.

Kwak HW, Lee WJ, Woo SM, Kim BH, Park JW, Kim CM, Kim TH, Han SS, Kim SH, Park SJ, Kook MC. Efficacy of argon plasma coagulation in the treatment of radiation-induced hemorrhagic gastroduodenal vascular ectasia. Scand J Gastroenterol. 2014 Feb;49(2):238-45.

Synopsis: Retrospective investigation (n = 18 patients) regarding the treatment of radiation-induced, hemorrhagic gastric duodenal vascular ectasia (GDVE).

Result: Following treatment: significant increase in the Hb value: from 6.6 g/dL (2.9-9.5 g/dL) to 9.7 g/dL (7.1-12.7 g/dL) (p < 0.001), fewer blood transfusions: 9.1 (0-30) instead of 4.1 (0-15) units v. erythrocytes / patient (p = 0.038). No severe complications, no deaths within the follow-up period of 4.7 months (0.6-24.5 months), no recurrence.

Conclusion of the authors: With APC, radiation-induced hemorrhagic gastric duodenal vascular ectasia can be effectively and safely treated in the short term.

APC TREATMENT OF ZENKER'S DIVERTICULUM

H. Manner, A. May, T. Rabenstein, O. Pech, L. Nachbar, M.D. Enderle, L. Gossner, C. Ell. Prospective evaluation of a new high-power argon plasma coagulation system (hp-APC) in therapeutic gastrointestinal endoscopy. Scand J Gastroenterol 2007; 42:397-405.

Synopsis: 216 patients were treated using high-power APC (HP-ACP) during a total of 275 sessions. Primary indications were additive ablation therapy in the case of Barrett's esophagus, palliative treatment of esophageal cancer, gastric polyps / carcinomas, angiodysplasia, Zenker's diverticulum and duodenal adenomas. Result: The mean number of required treatment sessions was 1.7 (1-5). For palliative tumor ablation in the esophagus, the number of sessions was 2.3 (1-5). Minor complications (pain, dysphagia, neuromuscular irritation, asymptomatic accumulation of gas in the intestinal wall) were observed in 29/216 patients (13.4%). Severe complications (perforation, stenosis) in 2 patients (0.9%).

Conclusion of the authors: HP APC appears to be safe and effective in the treatment of different GI conditions, as well as when using different types of endoscopy including double-balloon enteroscopy.

Wahab PJ1, Mulder CJ, den Hartog G, Thies JE. Argon plasma coagulation in flexible gastrointestinal endoscopy: pilot experiences. Endoscopy. 1997 Mar;29(3):176-81.

Synopsis: APC was used in order to treat 125 patients with different types of gastrointestinal disorder.

Result: For local palliative treatment, APC was used successfully in addition to loop coagulation, dilatation, stent implantation and/or radiotherapy in order to treat the following indications: esophageal cancer, gastric carcinomas, rectosigmoid carcinomas and papillary carcinomas.

Repeated treatment was also effective in tubulovillous adenomas of the rectum, stomach, duodenum and papilla. Moreover, APC proved helpful in the coagulation of residual tissue, in staunching of bleeding after polypectomies and in the endoscopic treatment of Zenker's diverticulum.

Finally, APC was helpful in the coagulation of multiple gastric polyps, in staunching of bleeding in surface bulbus ulcers, following dilatation of benign anastomotic stenoses in the esophagus and colon, and in the case of vascular malformations in the colon, duodenum, maxillary sinus, and in gastric antral vascular ectasia.

Conclusion of the authors:

These preliminary experiences demonstrate that APC can be effectively implemented in numerous indications and that it would appear to be relatively safe.

RECANALISATION OF STENOSES

Jia R, Guo R, Liu G, Yuan X, Dong C, Shan T, Yuan X, Zhang Y, Tai EW, Feng X, Gao S. Evaluation of combined argon plasma coagulation and Savary Bougienage for the relief of anastomotic-stenosis after esophageal squamous cancer surgery. Dig Surg. 2014;31(6):415-21.

Synopsis: Prospective study of 90 patients on the treatment of stenoses in esophageal cancer. A comparison was made between: 1) APC vs. 2) APC plus bougienage vs. 3) Bougienage only. Primary study objective: dys

phagia-free survival up to 6 months after treatment. Results: With APC plus bougienage, it was possible to prevent dysphagia for 115.63 days (95% CI, 105.31-125.95). Conclusion of the authors: APC and bougienage was a safe and comfortable treatment method for alleviating the symptoms of dysphagia in esophageal cancer without complications. Data taken from the abstract published in PubMed.

Hamada T, Nakai Y, Isayama H, Saito K, Kogure H, Sasaki T, Yamamoto N, Hirano K, Tada M, Koike K. Trimming a covered metal stent during hepaticogastrostomy by using argon plasma coagulation. Gastrointest Endosc. 2013 Dec;78(6):817.

Synopsis: Individual case report: successful trimming of an EUS-HGS stent using APC. Devices, instruments, settings: VIO300D, APC2; ERBE Elektromedizin, Tuebingen, Germany; power: 80 W gas flow rate: 2 L / min.

POLYPECTOMIE WITH ENDO CUT® Q / PAPILOTOMY WITH ENDO CUT® I

Tsuji S, Itoi T, Sofuni A, Mukai S, Tonzuka R, Moriyasu F. Tips and tricks in endoscopic papillectomy of ampullary tumors: single-center experience with large case series (with videos). J Hepatobiliary Pancreat Sci. 2015 Jun;22(6):E22-7.

Synopsis: Use of the ENDOCUT mode from Erbe in a papillectomy (papillary tumor) in 115 patients, removed using the en-bloc or piecemeal

technique.

Result: 93 (80.9%) of the patients could be treated in just one session. The full resection rate was 98.2%.

Conclusion of the authors: Endoscopic papillectomy was acknowledged as a safe and reliable treatment of ampullary adenomas.

ASGE Technology Status Evaluation Report. Electrosurgical generators. *Gastrointestinal Endoscopy* Volume 78, No. 2:2013.

Synopsis: Feature represents the current state-of-the-art of electrosurgical generators. The article notes a safety aspect in the use of argon-plasma coagulation. It is noted that the power output as well as the duration of application are considered critical to the thermal effect in the tissue. Devices, instruments, settings: no information provided

Fry LC, Lazenby AJ, Mikolaenko I, Barranco B, Rickes S, Mönkemüller K. Diagnostic quality of: polyps resected by snare polypectomy: does the type of electrosurgical current used matter? *Am J Gastroenterol.* 2006 Sep;101(9):2123-7.

Synopsis: The goal of this study was to evaluate and compare the diagnostic quality of polyps following a snare polypectomy (using two different electrosurgical currents). Result: 116 patients received 148 polypectomies (78 using intermittent mode and 70 using ENDOCUT mode).

The thermal intensity with ENDOCUT was lower than in the case of intermittent mode ($p < 0.02$). Polyps that were resected using ENDOCUT could be more easily evaluated at the margins (75.7% to 60.3%, $p = 0.046$). The overall tissue structure was similar in both groups. Polyps that were removed using intermittent mode demonstrated poorer quality overall in comparison with polyps removed using ENDOCUT ($p = 0.024$).

Conclusion of the authors: Significant tissue damage occurred more often when intermittent mode was used than when using ENDOCUT. The overall quality of the samples was better when ENDOCUT mode was used.

Akiho H, Sumida Y, Akahoshi K, Murata A, Ouchi J, Motomura Y, Toyomasu T, Kimura M, Kubokawa M, Matsumoto M, Endo S, Nakamura K. Safety advantage of endocut mode over endoscopic sphincterotomy for choledocholithiasis. *World J Gastroenterol.* 2006 Apr 7;12(13):2086-8.

Synopsis: Retrospective study of 134 patients with choledocholithiasis. Comparison investigating whether an automatically controlled cutting system (ENDOCUT modes) can reduce the complication rates of endoscopic sphincterotomy (EST) and serum hyperamylasemia following EST in comparison with conventional intermittent mode.

Result: Of the 134 patients, 79 were assigned to the conventional group (intermittent mode) and 55 to the ENDOCUT mode group. There was no significant difference between the groups in terms of age, gender and serum amylase level prior to EST. Complications were determined in 5 patients in the ENDOCUT group (9%):

Hyperamylasemia (5 times high than normal) in 4 patients and moderate pancreatitis in one patient.

Complications were determined in 13 patients in the conventional intermittent mode group (16%):

Hyperamylasemia in 12 patients and moderate pancreatitis in one patient. Serum amylase level was raised in both groups after 24 hours EST ($P < 0.02$). The average serum amylase level 24 hours after EST in the conventional intermittent mode group was significantly higher than in the ENDOCUT mode group ($p < 0.05$).

Conclusion of the authors:

ENDOCUT mode offers safety benefits in comparison with conventional mixed cutting mode for pancreatitis following EST as a result of a reduction in hyperamylasemia.



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