

BJS



Abstracts of the 105th Annual Congress
of the Swiss Society of Surgery,
held in Basel, Switzerland,
16 May – 18 May 2018

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May 2018 Volume 105 Supplement 3

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Switzerland, 16 May–18 May 2018

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Periodical ID Statement

BJS (Print ISSN 0007-1323 Online ISSN 1365-2168) is published monthly. US mailing agent: Mercury Media Processing, LLC, 1850 Elizabeth Avenue, Suite #C, Rahway, NJ 07065, USA. Periodical postage paid at Rahway, NJ, USA.

Postmaster: send all address changes to *BJS*, John Wiley & Sons Inc., C/O The Sheridan Press, PO Box 465, Hanover, PA 17331, USA.

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ISSN 0007-1323 (Print)
ISSN 1365-2168 (Online)

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Printed in Singapore by Markono Print Media Pte Ltd.

BJS

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Swiss Society of Surgery

The following abstracts will be presented at the 105th Annual Congress of the Swiss Society of Surgery, held in Basel, Switzerland, 16 May – 18 May 2018.

Breast and surgical oncology

Hyperthermic Intraperitoneal Chemotherapy (HIPEC) can trigger a systemic inflammatory response by intestinal bacterial translocation. A prospective study in humans

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Objective: CRS/HIPEC has become a treatment of choice for many patients with peritoneal metastasis originating from appendix or colorectal tumors, leading to improved survival rates. However, the pathophysiology behind HIPEC is only poorly understood, and there is an ongoing discussion which protocol to use for HIPEC: a mitomycin C based protocol currently preferred by many surgeons in the US, or the oxaliplatin based protocol developed by FRENCH groups. Here, we describe for the first-time dramatic changes in the postoperative systemic inflammatory reaction, highly different among treatment protocols.

Methods: 164 patients after CRS/HIPEC were included in a prospective database. HIPEC was performed according the US protocol (90 min at 42 °C with mitomycin C/doxorubicin) or the FRENCH protocol (30 min at 43 °C with oxaliplatin). White blood cells (WBC), C-reactive protein (CRP), body temperature, thrombocytes were serially analyzed. In (n=61) patients, serial blood samples were assessed for procalcitonin (PCT), Interleukin-6 (IL-6), pancreatic stone protein (PSP), and bacterial components (16 s rDNA).

Results: In patients treated with the US protocol, a significant secondary CRP increase (p=0.039) was observed in the second postoperative week, even after uncomplicated CRS/HIPEC, highlighting an ongoing inflammatory process (Figure 1). This increase did not correlate with infectious complications, and hence, postoperative CRP levels did not contribute to clinical decision making. To test our hypothesis of intestinal translocation after HIPEC with the US protocol, patients with an uncomplicated course were further explored, and compared to patients after HIPEC with oxaliplatin (FRENCH). After HIPEC with the US protocol, but not after the HIPEC with the FRENCH protocol, a massive increase of PSP (p=0.014) (Figure 2), and increasing IL-6 levels (Figure 3) were observed, indicating a triggering source from the portal blood flow. Finally, elevated 16 s rDNA levels (p=0.022) in the serum (Figure 4), identified a bacterial origin, mostly due to intestinal translocation after HIPEC with the US protocol.

Conclusion: HIPEC with the US protocol induces a systemic inflammatory response secondary to intestinal bacterial translocation. These dramatic changes, not observed after HIPEC with oxaliplatin, are an important and novel finding in the still poorly understood pathophysiology of HIPEC. Beilage 1347.

Advanced training and professional policies

What matters most to Millennials in surgical residency: a 5 year nationwide survey

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Objective: Contemporary surgical residents have different expectations and goals than prior generations. Indeed, surgery departments are struggling to fill open positions and to limit resident attrition, while little is known about what truly matters for Millennials. This survey investigated the key factors that determine the choice of a teaching hospital for the current generation of surgical residents.

Methods: Participants to the first step of surgical qualification (Basisprüfung Chirurgie) were surveyed using a 81-item questionnaire looking at hospital/residency attractiveness, hospital organization, communication, teaching culture, working hours, and hospital teaching status and location. Results were reported as mean (m), standard deviation (SD), and range (R) on a 1-6 scale (1 worst, 6 best). Results were adjusted for sex, age, and nationality.

Results: The survey was administered yearly for the last 5 years (2013-2017) and 1'825 questionnaires were evaluated (return rate 85%). The male to female ratio was 58%: 42% (1'059 men, 766 women). Most participants were residents (95.7%) with a mean age of 30 years (SD 3.4, R 23-51). More women (W 41%) and men (M 39%) aimed at general surgery, followed by orthopedic surgery where males still dominated (M 32%, W 20%), whereas the third specialty was plastic surgery for women (9%) and urology for men (9%). The 2 most influential factors in determining hospital/residency attractiveness were a structured teaching environment, including active involvement in surgical cases (m 5.57 SD 0.73), and fun & interest in everyday work (m 5.56 SD 0.74). A kind communication style (m 5.45, SD 0.47), a constant increase in salary (m 4.98, SD 0.92), and maintaining work-life balance (m 4.97, SD0.42) were further important aspects. Adjusting these results for sex, age, and nationality showed no influence of these factors on the key drivers of choice of a surgical department (smallest p=0.063). Interestingly, both genders regarded equally childcare availability (m 3.49, SD 1.43) and the opportunity of part-time work (m 3.57, SD 1.56).

Conclusion: Millennials value most a structured learning environment with active involvement in the operating room, fun & interest in everyday's work, and good working relationships over working hours regulations and salary/prestige. Surgical leaders may consider these generational drivers when shaping one's teaching and working environment.

Impact of sleep deprivation on surgical laparoscopic performance - a computer based crossover study

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Objective: Despite work hour restrictions, 24-hour calls remain an important part of patient care and surgeon's training. Whether surgeon's motor activity is affected by virtue of sleep deprivation remains controversial. The aim of the present study was to assess the effect of 24 hours of sleep deprivation on non-physicians in computer-simulated laparoscopy.

Methods: Crossover study. Motor activity was assessed following 24 hours of sleep deprivation and after being well rested in 20 non-physicians using a

virtual-reality trainer. Participants attended a standardized training preceding the study and were randomly assigned to perform simulator tests either well rested first and sleep deprived subsequently or vice versa. Both simulator tests were performed within 48 to 96 hours after the training. Additionally, several participants' characteristics possibly influencing motor activity were assessed by multivariate analysis.

Results: In three different tasks performed, no significant differences in total time to complete the procedure, average speed of instruments, and path length of instruments were seen between conditions, with one exception. During one task, instrument path length was significantly longer following sleep deprivation ($p=0.0435$). Error rates (i.e. non-cauterized bleedings, perforations, etc.), as well as precision, and accuracy rates showed no difference between conditions. None of the assessed characteristics had an effect on simulator performance.

Conclusion: Twenty-four hours of sleep deprivation does not seem to affect laparoscopic performance assessed by computer-simulated programs. If this finding can be transferred directly to surgical performance in the operating room may not be answered by the present study.

Endocrine

Cryopreservation of parathyroid tissue – useless or indispensable adjunct in parathyroid surgery?

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Objective: Patients with sporadic, primary hyperparathyroidism (pHPT) treated with focused parathyroidectomy have no risk for developing permanent, postoperative parathyroid insufficiency (PPPI). This risk rises considerably in patients operated for persistent or recurrent pHPT or patients treated either with subtotal or total parathyroidectomy with autotransplantation for hereditary or secondary hyperparathyroidism (sHPT). PPPI represents a severe complication involving a major loss of quality of life due to loss of cognitive functions, a lifelong medication with lifelong follow-up checks and consecutive damage mainly to renal function. It is also associated high medical costs. For patients with PPPI metachronous autotransplantation (MAT) of parathyroid tissue is the only option to re-establish PTH-function and prevent PPPI. At present many clinics are unfortunately forced to forego cryopreservation, as it is not remunerated and cryopreservation of living material is subject to ever-increasing legal requirements. This study aims to establish the frequency and success-rate of MAT in patients with PPPI after surgery of pHPT or sHPT.

Methods: Retrospective analysis of prospectively collected data on patients having parathyroid tissue cryopreserved after parathyroid surgery between 2009 and 2017.

Results: Parathyroid tissue was cryopreserved in 54 of 59 patients undergoing parathyroidectomy for sHPT (91.5 %) and in 20 of 451 patients operated for sporadic or hereditary pHPT (4.4%). Ultimately, only 7 patients with cryopreserved tissue underwent MAT (9.5%) for PPPI. Median time span from initial surgery to MAT was 6 days (range 1-190). In 3 patients autografts established full biochemical functionality; in 3 patients partial functionality was reached and 1 patient had a complete graft failure.

Conclusion: MAT of cryopreserved parathyroid tissue re-established partial or full parathyroid function in 6 out of 7 patients and therefore fortunately averted the full impact of PPPI in 85.7% of autografted patients. However, they represent only 9.5% of the patients having tissue cryopreserved and only 1.4% of patients initially undergoing parathyroid surgery. From the clinician's point of view, it is great to have this remedy to prevent PPPI – however, if costs and legal requirements for cryopreservation were to increase in the future, the effort to maintain this therapeutic option would probably be questioned.

Therapeutic options for neuroendocrine tumors: network meta-analysis of randomized controlled trials

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Objective: The wide range of therapeutic options for neuroendocrine tumors, as well as the various combination and sequencing possibilities open encouraging opportunities in the treatment. The aim of the present network meta-analysis was to assess and weight existing evidence in the therapy of gastroenteropancreatic neuroendocrine tumors (GEP-NETs).

Methods: Electronic databases (MEDLINE, Embase, Cochrane Central Register of Controlled Trials) were searched for randomized controlled trials examining the treatment of GEP-NETs. A network meta-analysis was performed with a frequentist approach. The two endpoints disease control after 12 months and progression-free survival were analyzed separately for pancreatic and gastrointestinal NET. We furthermore evaluated the inclusion of the studies in the NANETS and ENETS consensus guidelines, as well as their sponsorship by the industry.

Results: Of 31 identified randomized controlled trials with a total of 3294 recruited patients, 13 randomized controlled trials were included in the network meta-analysis. For disease control in pancreatic NETs, everolimus plus somatostatin analogue (P-score: 0.81) and interferon plus somatostatin analogue (P-score: 0.72) showed the highest control rates. For gastrointestinal NETs, bevacizumab plus somatostatin analogue was most beneficial (P-score: 0.93) for disease control. The longest progression-free survival for pancreatic NET was found after interferon plus somatostatin analogue (P-score: 0.75), and for gastrointestinal NET after DOTATATE (P-score: 0.97). Of the 31 publications, only 11 (35 %) were cited in the NANETS consensus guidelines and 18 (58 %) in the ENETS consensus guidelines. Overall, 22 publications reported industry sponsoring, generating a total of 23 citations in the NANETS and/or ENETS guidelines, whereas publications not reporting industry sponsoring generated 6 citations.

Conclusion: Combination therapies were most beneficial in the treatment of GEP-NETs. While most randomized controlled trials on the treatment of GEP-NETs were not included in NANETS and ENETS guidelines, industry sponsored studies were more likely to be included. This network meta-analysis provides a framework for guidelines and informed clinical decision-making.

Basic research

The regenerating liver is vulnerable to lymph circulating intestinal bacteria

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Objective: The liver has a pivotal role in antimicrobial defense against intestinal microbiota. Its function includes eradicating live microbes and its derived metabolites, which promiscuously penetrate in the organism and circulate either the blood stream or lymphatics. The interference of the microbiota and microbial-derived metabolites with liver regeneration remains to be elucidated.

Methods: Two third partial hepatectomy was performed in colonized (specific pathogen free) and axenic (germ-free) C57Bl/6 wild type, Rag 1-/- (lacking T, and B cells) and Rag 2-/- γ c-/- (lacking T, B, NK, and innate lymphoid cells)

mice. Liver regeneration was assessed by using the qPCR method of different liver regeneration genes or by counting of Ki-67 positive nuclei of the regenerating liver. Regeneration pathways were assessed by RNA sequencing. Serum transfer was performed using serum from colonized or germ free donor mice into germ free recipient mice. Bacterial translocation post-partial hepatectomy was assessed in mesenteric lymph nodes, liver, spleen, and lungs in colonized mice. Additionally, bacterial translocation was assessed upon monocolonisation with *Escherichia coli* JM83. Thoracic duct ligation was combined with partial hepatectomy in Rag 2-/- γ c-/- mice.

Results: Hepatic RNA sequencing revealed different but redundant regeneration pathways in colonized versus germ-free wild type mice. In colonized mice, liver regeneration is mediated by microbial-derived metabolites. Absence of the innate lymphoid compartment is associated with incessant translocating bacteria into the host impairing liver regeneration. Ligation of the thoracic duct revealed that full intestinal bacteria enter via lymphatic vessels into the systemic circulation. Under axenic conditions, lack of the innate lymphoid compartment did not alter hepatic regeneration.

Conclusion: In the regenerating liver, life bacteria directly enter the systemic circulation via lymphatic spread thereby bypassing the liver. A functional hepatic innate lymphoid compartment is required to protect the liver against such systemic bacterial translocation. Conversely, bacterial products enter the liver via the portal circulation and induce specific proliferative responses.

Performance of nasal chondrocytes in an osteoarthritic environment

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Objective: Our recent first-in-human trial demonstrated feasibility and safety of tissue engineered cartilage grafts generated with autologous nasal chondrocytes (N-TECs) when transplanted into focal articular cartilage defects. To extend this concept towards the treatment of osteoarthritic (OA) cartilage defects, we investigated (i) the response of N-TECs to inflammatory factors, (ii) their capacity to modulate the inflammatory profile of OA joint cells and (iii) their integration into OA osteochondral (OC) tissues in vivo.

Methods: Human cells were isolated from healthy cartilage biopsies (nasal septum (NC), articular cartilage (AC)) and osteoarthritic tissues (articular cartilage (OA_AC), OC tissues, synovia (Syn)). Expanded NC and AC were re-differentiated for 14d to generate N-TECs and AC-based-TECs (A-TECs). Then, TECs were (i) exposed to inflammatory cytokines (IL-1 β /TNF α /IL-6) for 14d and analysed by Safranin-O and Collagen-II staining, glycosaminoglycan (GAG) content and by RT-PCR; (ii) used to produce conditioned media (CM) that was applied to OA_Syn or OA_AC cultured on a microfluidic device. Effects of TEC-CMs were determined by Collagen-II and MMP-13 staining, secreted cytokine quantification and quantitative RT-PCR. (iii) N-TECs were applied into cartilage defects created in OA-OC plugs prior subcutaneous implantation in nude mice for 8 weeks.

Results: (i) GAG contents in N-TECs were not significantly affected following exposure to inflammatory cytokines. Superior cartilaginous matrix, however, was observed for N-TECs, as compared to A-TECs. (ii) TEC_CM application on OA-Syn significantly reduced pro-inflammatory cytokine secretion. Reduced levels of TNF α and IL-6 were only observed when exposed to N-TEC_CM (~1.6-fold). In a microfluidic device, only N-TEC_CM reduced expression of MMP-13, ADAMTS-5 and IL-8 (>10-fold). (iii) N-TECs maintained their cartilaginous extracellular matrix and integrated well to subchondral bone and adjacent native OA cartilage in the in vivo OA environment.

Conclusion: N-TECs can be envisioned for the treatment of OA defects, due to their capacity to (i) maintain cartilaginous matrix after exposure to inflammatory cytokines, (ii) dampen inflammatory/catabolic molecule production by OA joint cells, (ii) preserve cartilaginous features in an in vivo OA environment and successfully integrate to adjacent native tissues.

Impaired clearance of microbial-derived metabolites after major hepatic resection

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Objective: Clearance of invading pathogens and their metabolites relies on the filter function of the liver. During liver regeneration following liver resection such clearance is potentially impaired. The aim of the current study was to determine the metabolomics-profile after different degrees of liver resection.

Methods: Increasing levels of liver resections (30%, 70%, 80% and 90%) in C57Bl/6 mice was performed. Plasma samples were collected 8 hours post-surgery and host and microbial derived metabolites were analyzed using untargeted metabolomics (LC-MS). Identity of metabolites was assessed using HMDB database.

Results: Total amount of microbial-derived metabolites in the plasma increased with the percentage of liver resection. A cluster analysis for microbial derived metabolites by level of partial hepatectomy composed specific groups. Identified metabolites were either directly derived from the microbiota or derived from the host and transformed. Specifically, 5-aminopentanoid acid, etiocholanedione (marker of microbiota contamination in the urine) and melibiose are non-transformed metabolites of microbial origin that were increased in the plasma of mice by increasing the degree of partial hepatectomy. Tau-rodeoxycholate and other secondary bile salt metabolites, that are transformed by bacteria, and reabsorbed in the gut, were increased depend on the degree of liver resection.

Conclusion: The concentration of microbial-derived metabolites increases proportionally to the degree of liver resection. The capacity of the liver to clear bacterial metabolites is impaired upon major liver resection.

Kidney and transplant surgery

Management of arterial conduits in rescue liver transplantation - first multicenter risk analysis to improve outcome

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Objective: Arterial conduits (AC) in liver transplantation (LT) offer an effective rescue option when regular arterial graft revascularization is not possible. Although lifesaving, there is still controversy concerning placement side and need for postoperative antiaggregation/anticoagulation therapy.

Methods: This is an international, multicenter cohort study of adult deceased donor LT requiring AC. The study included 13 high-volume LT centers and covered the period from January 2007 to December 2016. Primary endpoint was arterial occlusion/patency. Secondary endpoints included intra- and peri-operative outcomes as well as graft and patient survival. The study has been registered at ClinicalTrials.gov (NCT03275883).

Results: The cohort was composed of 501 LT using aorto-hepatic (n=478) or iliac-hepatic (n=14) AC. Among aorto-hepatic AC, infrarenal aortic placement was performed in 77% while supraceliac placement in 23%. Median lab-MELD at the time of LT was 22 (range 6-50) and Re-LT proportion was 38% (n=194). Early occlusion (≤ 30 days) occurred in 7% and 90-day mortality rate was 13%. When AC allografts were used (n=493), primary patency was equivalent for supraceliac, infrarenal, and iliac placement while prosthetic conduits (n=8) were associated with poor patency. Multi-variate regression analysis identified MELD >30 , Re-LT, coronary artery disease (CAD), and requirement of intraoperative platelets transfusions as independent risk factors for early occlusion. Postoperative platelet antiaggregation regimen differed among centers and was given in 49% of cases. Graft survival was significantly superior for patients receiving platelet aggregation inhibitors after LT. Multi-variate analysis identified Re-LT (HR 1.64; 95%CI 1.12-2.40; p=0.01) and the absence of antiaggregation after LT (HR 1.66; 95%CI 1.14-2.42; p=0.008) as independent risk factors for reduced graft survival.

Conclusion: When AC are required for rescue graft revascularization, the conduit placement side appears to be negligible and should follow the surgeon's best preference. In the high risk group of rescue LT with AC, the study findings support the concept of postoperative antiaggregation due to its graft protecting effect.

Kidney re-transplantation after graft failure: A single center experience

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Objective: There is an increasing demand for kidney re-transplantation. To date most studies report inferior outcome compared to primary transplantation, consequently feeding an ethical dilemma in the context of chronic organ shortage. In addition, criteria favoring re-transplantation remain unknown.

Methods: We retrospectively analyzed all patient transplanted at our center between 2000 and 2016 with follow up until 12/2017. Survival was estimated with Kaplan-Meier method, chance of re-transplantation with Cox regression, using time to transplantation as dependent variable.

Results: Over all 1376 primary transplants and 192 (12%) first re-transplants were performed. 10-year graft survival was comparable for primary transplantation and first re-transplantation (67% vs. 64%, log-rank p=0.08). Among all 341 patients who lost their graft and went on dialysis, a consecutive 223 (65%) individuals received a new kidney (192 second, 28 third, 2 fourth re-transplantation). Multivariate Cox regression revealed, that candidates were significantly more likely to have re-transplantation if age at graft loss was < 65 years (likelihood ratio LR 2.7; 95%CI 1.3-5.5), initially ≤ 1 light comorbidity in the Charlson-Deyo-Index (LR 1.5; 95%CI 1.0-2.4), BMI < 30 kg/m² (LR 2.1; 95%CI 1.0-4.8), former graft survival > 5 years, initial duration of dialysis < 3 years (LR 1.7; 95%CI 1.2-2.4), initial use of peritoneal dialysis (LR 1.5; 95%CI 1.1-2.2), and a minimized number of previous re-transplants (LR 1.4; 95%CI 1.0-2.0).

Conclusion: Our data demonstrate comparable graft survival for primary- and re-transplant within the first 10 years. Eligible patients should have readily access to re-transplantation. Further studies are needed to demonstrate, which of our current likelihood factors are truly legitimate in optimizing candidate selection for re-transplantation.

Long-term outcome of DCD kidney transplantation

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Objective: Donation after circulatory determination of death (DCD) represents up to 20% of used kidney grafts. Numerous studies have shown similar outcome compared to donation after brain death on the short- and mid-term. Until now, long-term outcome has though never been shown. The aim of this study was to complete long-term follow up and graft survival of a controlled-group study comparing DCD and DBD kidneys.

Methods: We retrospectively analyzed all patients transplanted at our institution between January 1985 and March 2000. All DCD recipients were matched one-to-one with patients transplanted with DBD grafts during this period. Graft survival was estimated with Kaplan-Meier method.

Results: Overall 1133 kidneys were transplanted during this period. Of these, 122 patients received a graft from a DCD donor and accordingly matched with 122 DBD recipients. Results showed similar graft-survival in both groups, with no significant difference (p=0.93). Median graft survival after 33-years follow-up was 25 years (305 months) in DBD, and 26 years (315 months) in DCD. Delayed graft function occurred in 59 patients in the DCD group compared to 29 in the DBD group (p=0.001).

Conclusion: This is the first study to show similar outcome in DCD kidneys compared to DBD after 30 years follow-up. Although the incidence of delayed graft function is higher after DCD, these graft are a valuable resource and should probably be handled in the same way as DBD grafts.

Beilage 1525.

Pelvic polytrauma

How reasonable are the Swiss criteria to predict trauma centre need according to High Specialized Medicine (HSM)?

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Objective: Worldwide the most frequently used indicator to determine trauma center need (TCN) is a patient Injury Severity Score (ISS) > 15 , following the American College of Surgeons (ACS) recommendations. In contrast, the Swiss HSM trauma inclusion criteria were defined as an ISS > 19 or an Abbreviated Injury Severity (AIS) of the head > 2 . We were interested to what extent this Swiss modification makes sense in respect of the most important outcome parameter mortality.

Methods: Retrospective analysis of all adult major trauma patients (> 16 years; new ISS, NISS ≥ 8), treated as emergencies in a Swiss trauma centre from 2010-2016. In a systematic database consecutively collected cases were analysed regarding ISS and AIS head in respect of mortality and risk adjusted probability of decease (RISC 2).

Results: Among 2171 patients 40.1% fulfilled ACS- and 52.7% HSM-criteria. Detailed comparative analysis with regard to observed mortality and RISC 2 in specified subgroups (constituting different possible combinations of the ISS and the AIS head in the TCN definitions; Tab. A), revealed two main findings: (1) In comparison to an AIS head ≤ 2 an AIS head > 2 significantly increased mortality and RISC 2 in all subgroups of patients with an ISS < 19 , whereas in more severely injured patients (ISS > 19), head injury increased the risk for mortality only starting with an AIS > 3 . (2) Even though mean mortality for patients with ISS 16-19 and AIS head < 3 (ACS, non-HSM) was found to be lower than in all subgroups of HSM-patients, it was two times as high as for patients being neither part of the ACS nor the HSM group (ISS < 16 & AIS head < 3).

Conclusion: Regarding the increased mortality-risk in patients with AIS head >2, the use of this HSM criterion appears to be reasonable. In contrast, the exclusion of trauma severity ISS 16-19 from the HSM criteria seems to be debatable. Our results should be further tested in larger cohorts. Beilage 1377.

Polytrauma computed tomography in the emergency treatment of trauma patients – a consecutive trauma centre evaluation

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Objective: The application of head-to-hip computed tomography in the emergency treatment of potential polytrauma (PTCT) is still under debate. Given the conflicting data in the literature, we analysed our own experience for effective benefits and limitations in the use of this diagnostic tool.

Methods: Retrospective analysis of all emergency trauma cases undergoing PTCT in a Swiss centre from 2011-2016. Standardised data record; Abbreviated Injury Severity (AIS) and (new) Injury Severity Score (NISS and ISS, resp.) were used for comparing the findings of diagnostic tools and the maximum information available at the time of discharge (Mean +/- SD; ANOVA).

Results: 1625 consecutive cases (33.2% female; 48+/-21 years) underwent PTCT in the observation period, on average 35+/- 41 minutes after arrival of the patient. At hospital discharge 27% of patients revealed to have no injury lesions at all (NISS = 0), 20% minor trauma (NISS 1-7), 29% major trauma (NISS 8-15) and 23% more severe trauma (ISS > 15). In 95% of cases PTCT was preceded by at least one of the Advanced Trauma Life Support (ATLS) conventional diagnostic work-up tools (sonography of the abdomen, FAST, and/or an X-ray of the thorax or pelvis), with 79% patients (n = 1315) undergoing the complete ATLS-work-up. Using PTCT, in 71% at least one trauma lesion (AIS > 0) and in 90% (n = 1460) incidental findings were detected, 20% of the latter needing further evaluation or treatment. In comparison to the preceding ATLS-work-up, PTCT detected more trauma sequelae (p < 0.001): In 45% a new diagnosis was identified and in 21% followed by an emergency intervention. Following PTCT, mean trauma severity (AIS) increased by 1.1+/-1.3 in comparison to conventional work-up (p < 0.001). The severity of diagnoses in the definitive PTCT report on average increased by AIS 0.43 when compared to the initial emergency PTCT report (p < 0.001), resulting in 18 cases (1.1%) with a change of treatment. In comparison to the complete information at the time of hospital discharge, PTCT in 16% missed at least one diagnosis.

Conclusion: In this series of emergency cases, PTCT demonstrated its theoretical usefulness in about 3/4 of patients. On the other hand, clinical indispensability was given in only about 1/4 of cases, resulting in the need for further measures as to avoid the overuse of this radiation tool.

Treatment and outcome following adult trauma emergencies – when does age really matter?

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Objective: It is commonly accepted that outcome following major trauma is markedly reduced in the elderly, at the same time management of such cases is experienced to be more complex. The aim of this study was to investigate the differences of injury-, treatment- and mortality-related characteristics between younger and elderly patients with the objective to improve the outcome of injured.

Methods: Prospective analysis of consecutive emergency room cases (age >=16 years) admitted to a Swiss trauma centre from 1.1.2013 - 31.12.2016, including demographic-, injury, treatment- and outcome-related variables (mean +/- SD; chi-square, ANOVA).

Results: Among 1796 trauma emergencies treated in the study period, 27% (n = 489) were at least 65 years old. In comparison to younger trauma patients these elderly on average were more often female (p = 0.002) and Swiss (p < 0.001), suffered low energy trauma (p < 0.001), were admitted secondarily

from a smaller hospital (p < 0.001) and presented with a higher injury severity (p < 0.001). In the elderly cohort treatment times were partly longer (e.g., prehospital p < 0.001; until CT p = 0.013 or intensive care p = 0.003), partly shorter (time in the emergency department p = 0.02), even though there was no difference between age groups in the frequency of examinations undertaken, e.g. a whole body CT (p = 0.398). Short term outcome was worse in the elderly cohort, both with regard to the Glasgow Outcome Scale at the end of hospital stay or hospital mortality (p < 0.001 each). If mortality was separately analysed for single decennia, a significant increase could be found beginning at the age of 65 years (p < 0.001). In contrast to the group of younger patients for whom actual mortality in our centre met expected risk adjusted mortality (RISC II), in the elderly a higher than expected mortality was found (23.9% vs. 17.5%, p < 0.001).

Conclusion: Our investigation demonstrated a worse outcome for elderly trauma emergencies beginning at an age of 65 and not with 55 as found in other studies. In contrast to other centres our elderly trauma victims were more severely injured than younger patients. As mortality in this age group was higher than expected and multivariate analysis did not reveal an obvious explanation further analysis of single cases is necessary.

Upper extremity (exclusive hand)

High rate of maintenance of self-independency and low complication rate with a new treatment algorithm for proximal humeral fractures in the elderly

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Objective: Treatment of proximal humeral fractures in the elderly remains controversial. Operative therapy with locking plates has gained popularity in recent years but high complication and revision rates are reported. Due to similar high numbers of complications at our institution with a large percentage of geriatric patients, we have changed our treatment algorithm in 2013. Conservative treatment is preferred for all two-part-fractures, with the exception of shear and varus-posterior types which are generally treated with a nail. Three- and four-part-fractures with no dissociation of the tubercula from the humeral head are considered to have similar bio-mechanical properties as two-part-fractures and are also treated conservatively as described above. Three- and four-part-fractures with dissociated tubercula and fracture dislocations are treated with primary reverse arthroplasty. Locking plates are not used. Aim of this prospective study is to assess this treatment algorithm and compare the results with an existing retrospective case series.

Methods: 83 consecutive patients >65 years with proximal humerus fractures treated according to this new algorithm at our institution were followed prospectively. Primary outcome was any loss of points in Suhm's 4-point self-independency score (1 at home, independent; 2 at home with help; 3 institutional with a degree of independency; 4 dependent). Secondary outcomes were complications and functional outcome (Constant score, SPADI, SSV).

Results: 77 patients had a final follow up at 12 months. 87% were female. 77% of the patients were treated conservatively and 23% had surgical treatment (15% reverse arthroplasty, 8% proximal humerus nail). 10% had a complication. 15% had a drop of at least one point in Suhm's independency score. Mean Constant Score 72.6, mean SPADI 90.0, mean SSV 81.6.

Conclusion: The prospective patient cohort matches well with the retrospective study group where 68% were treated operatively (predominantly PHILOS-plating) and 32% conservatively. Applying the new algorithm, the prospective group had more patients who were able to maintain their pre-morbid self-independency and return to their social environment. Furthermore patients had an overall better functional outcome and lower rates of complications and reoperations. Therefore we no longer use locking plates in the treatment of proximal humeral fractures in elderly patients.

Ultrasonographic visualization of the radial nerve early after osteosynthesis of humeral fractures is a reliable method to evaluate nerve continuity

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Objective: The rate of secondary radial nerve palsy due to surgical treatment of humeral shaft fractures ranges between 5 to 16%. To date, there are limited non-invasive methods for the detection of pathologies of the radial nerve directly after operative treatment of humeral fractures. Electrophysiological assessments are of limited value until 3-5 weeks after the operation. The aim of this study was to evaluate the feasibility and validity of radial nerve ultrasound early after osteosynthesis of humeral fractures.

Methods: Perioperative high-resolution ultrasound (HRUS) of the radial nerve in the context of humeral fractures is routinely performed since 2014 at our institution. All prospectively evaluated patients with an HRUS of the radial nerve early after osteosynthesis of a humeral fracture were retrospectively analyzed. Nerve HRUS with a GE Logiq S8 Ultrasound System with either a 6-15 MHz or 8-18i Hockey Stick high resolution linear array transducer was carried out by 4 examiners with more than 3 years of experience in nerve HRUS on average 8 (2-33) days after surgery. HRUS imaging of the radial nerve and the posterior interosseous nerve was performed at known vulnerable locations. To capture lesions in the whole course, the radial nerve was scanned axially in both proximal and distal directions.

Results: Of the analyzed 14 patients 3 had primary radial nerve palsy while 4 patients sustained secondary nerve palsy. Despite the presence of osteosynthetic material (plate or intramedullary nail) or soft tissue hematoma the intended HRUS of the radial and posterior interosseous nerve was feasible in every case. In 5 out of 7 (71.4%) patients with radial nerve palsy HRUS revealed a double crush sign. Nerve continuity was demonstrated in every patient. In patients with radial nerve palsy, continuity was confirmed by functional improvement and/or physiological nerve conduction studies.

Conclusion: Postoperative HRUS of the radial nerve early after osteosynthesis of humeral fractures is a safe, feasible and seemingly reliable method to show both radial nerve continuity and pathology. This method can provide valuable information concerning type, location and probably prognosis of the radial nerve lesion. It could influence the decision-making regarding an eventual need for surgical exploration of the nerve.

Displaced medial clavicle fractures; operative treatment with locking compression plate fixation

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Objective: Medial clavicle fractures are rare injuries and historically treated non-operatively. Displaced medial clavicle fractures, however, have a higher incidence of delayed- or non-union compared to non-displaced medial clavicle fractures and might benefit from operative treatment. We describe below a new technique for treating intra-articular fractures or extra-articular fractures with a small medial fragment by using special locking plates and present the results of our operatively treated patients.

Methods: First we describe our technique for treating these fractures with the radial (VA)-LCP™ Distal Humerus Plate (DePuy Synthes, Switzerland)(Figure 1 and 2). Second, a retrospective cohort study was performed. All patients operated on for a displaced medial clavicle fracture between 2010 and 2017 were included. Primary outcome was the QuickDASH score and the Subjective Shoulder Value (SSV). Secondary outcomes were operative complications including mal- or non-union and implant removal.

Results: All 15 patients were available for follow-up. Fourteen patients were included in our analysis. One patient was excluded due to severe concomitant injuries. The mean follow up was 39 months (range 7-79). The mean QuickDASH score was 0,65 (range 0-4.50, SD +/- 1.38) and the mean SSV was 96 (range 80-100, SD +/- 6.44). One patient had an early revision operation and

developed an infection after 1,5 years. No mal- or non-unions occurred. Seven patients had their implants removed.

Conclusion: Operative treatment of displaced medial clavicle fractures with well-fitting 'small fragment' locking plates provides an excellent long-term functional outcome. Intra-articular fractures or extra-articular fractures with a small medial fragment can be treated with the radial (VA)-LCP™ Distal Humerus Plate. Beilage 1225.

Lower extremity

Experience with the Distal Femoral Nail (DFN)[®] in the treatment of distal femoral fractures in the last 10 years

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Objective: Only 6% of all femoral fractures occur in the distal third. We see them in two main patient groups, young patients after high energy trauma and elderly patients with low energy trauma. More than 85% of patients are older than 50 years. Most of them are treated with minimal invasive surgical procedures, either nails or minimal invasive plate osteosynthesis (MIPO). Talking about DFN[®] there are often reserves because of the approach through the knee joint with possible iatrogenic damage of intraarticular structures. In comparison of the literature, there is actual no clear difference between the outcome of nails and plates. The goal of these work was to analyse our 10 year results in the treatment of distal femoral fractures with the DFN[®] in a mainly elderly patient collective.

Methods: We analysed patients treated with DFN[®] at our clinic in the last 10 years independent of age, gender or type of fracture (primary fracture, periprosthetic fracture) retrospectively. We considered the radiological healing of the fracture as well as the complication rate, the necessity of reoperation and the clinical outcome.

Results: Between 2008 and 2017 we treated 61 patients with a distal femoral fracture with the DFN[®]. 9 of them had a periprosthetic fracture. The average age was 77(18-103) years. We had 53 females and 8 males. 44 patients could be seen regularly in our outpatient department, in all of them the fracture healed (72%). 6 patients died short time after surgery, 10 were lost to follow up and 1 patient suffered a periimplant femoral fracture one month after osteosynthesis with DFN[®], so that the nail had to be removed for plate osteosynthesis. 1 patient developed an infection and a consecutive osteomyelitis.

Conclusion: The treatment of distal femoral fractures with the DFN[®] was successfully performed at our clinic in the last 10 years. Most fractures healed with good postoperative results and a high level of patient satisfaction. The DFN[®] is a valid alternative to the LISS[®] especially in geriatric patients or patients with knee prosthesis. Compared to plates it allows early weight bearing because of the biomechanical advantages of an intramedullary implant.

Surgical treatment of distal femur fractures in geriatric patients – from amputation to postoperative full weight-bearing

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Objective: The treatment of distal femur fractures in geriatric patients is challenging. Due to high perioperative complication rates, loss of reduction, non-union and a 5-year mortality-rate of 50% the results are mainly disappointing. Therefore non-operative treatment or primary amputation had still been a therapeutic recommendation until the late nineties. With the introduction of angular stable implants, the goal of osteosynthesis changed to reducing immobilisation, preserving quality of life and most importantly: enabling patients to return to their preoperative environment.

Methods: In this single institution case series, we retrospectively analysed the data of patients aged 65 years and greater, with fractures of the distal femur. All patients underwent fracture fixation with the Less Invasive Stabilisation System (LISS, DePuy Synthes) or Variable Angle Locking Compression Curved

Condylar Plate (4 mm VA-LCP, DePuy Synthes) between 2013 and 2017. Points of interest included perioperative morbidity, mortality, weight-bearing status and care-dependency after hospital discharge.

Results: 46 patients (86 years (65-99), 91% female (n = 42)), with 50 fractures of the distal femur (AO 33-A (78%), B (8%), C (14%)) were identified. Most patients (60%, n = 30) already had prior treatment with an implant due to a fracture (n = 8) or osteoarthritis (n = 22). The perioperative morbidity was 33% (n = 15), in-hospital mortality was 7% (n = 3). At the time of analysis, 57% (n = 26) of the patients had died, with a one-year mortality rate of 33% (n = 15). 52% (n = 26) of patients were mobilised without weight-bearing for six weeks postoperatively. Partial weight-bearing was allowed in 42% (n = 21) of patients, and 6% (n = 3) of patients were allowed immediate full weight-bearing. Out of the 20% (n = 9) of patients who were able to return to their home environment after temporary in-care or rehabilitation, 83% (n = 8) had been allowed partial or full weight-bearing.

Conclusion: Geriatric patients with distal femur fractures face a very high mortality rate. Despite a low perioperative local complication rate, no implant failures and stable fixations the rate of patients returning to their home environment was low. Early postoperative mobilisation appears to have a beneficial effect on the return home. In conclusion, we changed our weight-bearing restrictions in favor of immediate full weight-bearing, thereby hoping to preserve the patient's independence after this severe trauma.

DFN® (distal femur nail) in femur fractures distal or peri-implant to a PFNA® (proximal femur nail antirotation) – a valid option?

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Objective: Due to high incidence of intertrochanteric femur fractures, many elderly patients already have a PFNA® implanted. As a result of further falls, femur fractures distal or peri-implant to the nail occur. So far, no therapeutical standards for these injuries are described in literature. Our goal was to analyse our results in patients with a PFNA® implanted who suffered from a femur fracture distal or peri-implant to the nail, who underwent a removal of the PFNA® and the implantation of a DFN®.

Methods: Between January 2010 and December 2017, all patients with a femur fracture distal or peri-implant to a PFNA® who were treated with implant removal and DFN®, were analysed retrospectively. We considered the clinical outcome, the radiological healing and the complication rate, including the need for revision surgery and death rate.

Results: 12 patients who already had a PFNA® implanted and who suffered from a femur fracture distal or peri-implant to the PFNA® were recruited. After radiological verification of bone healing of the intertrochanteric femur fracture, every patient underwent a removal of the inlaying implant and the osteosynthesis with a DFN®. The cohort includes 1 male (8.3%) and 11 female (91.7%) patients. Average age was 88 years with a range of 60-103 years. Only in 1 patient a complication occurred: she died the first day after surgery. 1 patient got lost to follow-up. 10 patients had clinical and radiographic follow-up, average after 6.4 months (range 2-26 months) after surgery. No patient needed revision surgery. 9 patients (90%) showed a radiographic bone healing and a good clinical outcome.

Conclusion: Our data suggests that implanting a DFN® in patients with a femur fracture distal or peri-implant to an inlaying PFNA® with a healed intertrochanteric fracture is a valid treatment, as in our cohort, most of the patients showed a satisfying clinical outcome with a good bone healing and a very low complication rate.

Giant gluteal lipoma: an uncommon case

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Objective: Lipomas are benign and common soft-tissue tumors with many different clinical presentations. Surgical treatment is normally only considered when they are painful or an esthetical problem exists. With this extreme case, we show that global prolongation of life expectancy can lead to other indications of removal.

Methods: We describe the case of a 90 years old patient with a giant gluteal lipoma evolving for more than 20 years. The patient was well aware of this slow growing painless mass on his right hip, but refused any treatment. He was addressed to our surgical consultation by his family doctor for lameness and unbalanced walk. (Figure 1A and 1B).

Even though a benign lipoma was clearly suspected, a CT-scan was performed. However, the lesion was so large that it could not be scanned entirely (Figure 2). The tumor-like lipoma seemed to be in contact with the sacrum, the tuber ischiadicum and the greater trochanter. Furthermore there was a suspicion of an infiltration of the flexors muscles of the right leg. Vascularization existed mainly by an enlarged superior gluteal artery.

After discussing of the pros and cons of an intervention with the patient and his family, the indication was made to remove the mass surgically.

Results: The patient was installed in a dorsal decubitus position (Figure 3). The operation enabled the removal of a 30x60 cm 20-kg lipoma (figure 4). The pathology report confirmed that the tumor was benign. Skin was preserved in order to permit a functional reconstruction of the gluteal region. (Figure 5) Wound management was simple and there was an eventless follow-up. Additionally the patient received intensive physiotherapy for walk recovery and after 5 weeks he could achieve a completely independent walking.

Conclusion: What makes this case interesting is the fact that even a benign pathology such as a lipoma progressed into a situation requiring delicate surgical management, both due to the technical aspect of the operation itself, and because of the patient's advanced age.

Beilage 1615.

Vessel

Perioperative major adverse cardiac events in urgent femoral artery repair after coronary stenting

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Objective: Non-cardiac surgery early after coronary stenting has been associated with a high rate of stent thrombosis and catastrophic outcome. The aim of this study was to quantify the risk of major adverse cardiac events (MACE) after urgent femoral artery repair for puncture site complications after coronary stenting and to identify risk factors for MACE.

Methods: This is a retrospective observational study on consecutive patients who required urgent surgery for bleeding or leg ischemia early after coronary stenting between 2005 and 2015 in a tertiary referral centre in Switzerland.

Results: Seventy (0.5%) of 12'960 patients who underwent coronary stenting required surgery. Eight patients (11.4%, 95%CI 5.4-21.8) experienced 17 MACE within 30 days after surgery, including 5 deaths (7.1%, 95%CI 2.7-16.6). Significant predictors for MACE were cardiogenic shock on admission (HR 6.9, 95%CI 1.8-29.6), higher GRACE scores on admission (HR 1.3, 95%CI 1.1-1.5), limb ischemia as an indication for surgery compared to bleeding (HR 10.5, 95%CI 2.7-40.7) and longer duration of surgery (HR 2.6, 95%CI 1.2-5.5).

Conclusion: Femoral artery repair under double antiplatelet therapy for access site complications very early after coronary stenting is associated with only a modest MACE rate, and therefore a much better outcome than previously reported.

Reality check: primary vascular access creation today

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Objective: In Switzerland, there is no prospective register for patients having primary vascular access (VA) surgery for renal replacement therapy. As a result the outcome following VA creation in 4500 patients is unknown. The aim of the study was to assess the quality of vascular access creation and to compare it with the current literature and the guidelines, in order to define strategies to improve clinical outcomes.

Methods: Retrospective single-centre study in a tertiary referral centre. All consecutive patients over 18 years of age undergoing primary VA creation between January 2013 and December 2014 were included. Follow-up data for at least 12 months were collected using hospital records and by contacting external nephrologists for information.

Results: During the period, 365 patients had a surgical intervention for renal replacement therapy. A primary VA was created in 74 patients (20%), which were further analysed in our study: 63 (85%) had an arteriovenous fistula (AVF) and 11 (15%) an arteriovenous graft (AVG). The intervention-free survival (primary patency) of the primary VA at one year was 46% (95% CI 33-58) for AVF and 30% (95% CI 7-58) for AVG with a secondary patency at one year of 75% (95% CI 63 - 84) for AVF and 50% (95% CI 18-75) for AVG. Twenty-seven patients (36%) with primary VA underwent central venous catheter (CVC) placement (tunnelled and non-tunnelled) before the creation of the Access. Thirty-seven (50%) patients had their first dialysis through a CVC. 31 patients (42%) never received a CVC.

Conclusion: The primary patency of VA was unexpectedly low, and the number of CVC requests unexpectedly high. In light of this we consider it to be essential that centres which create VA register their activities and compare their outcomes with the upcoming medical societies' guidelines to check and improve their clinical management. To facilitate this there is an initiative starting 2018 which encourages all Swiss vascular surgeons to provide data on VA interventions, including outcomes at 12 months follow-up, in the national online registry "SwissVasc 2.0".
Beilage 1315.

Quality of life and post-thrombotic syndrome after surgical thrombectomy of acute iliofemoral deep vein thrombosis

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Objective: Patients with post-thrombotic syndrome (PTS) after deep vein thrombosis (DVT) show poorer quality of life (QoL) and more symptoms than patients without PTS. Catheter-directed or pharmaco-mechanical thrombolysis (CDT/PCDT) present the first-line recommendations for treatment of acute iliofemoral deep vein thrombosis (IFDVT). However, CDT and PCDT fail to significantly decrease the occurrence of PTS compared to anticoagulation (ATTRACT Trial). Secondary outcome for health-related QOL after catheter-directed thrombolysis also did not differ compared to standard treatment (CaVenT).

As an alternative treatment option, surgical thrombectomy is recommended only in cases in which a patient is not a candidate for CDT or PCDT. The aim of this study is to analyze long-term clinical outcome after surgical thrombectomy of acute IFDVT in terms of quality of life and the occurrence of post-thrombotic syndrome.

Methods: All patients who underwent surgical thrombectomy at our institution between April 2008 and April 2017 were included. Only patients with iliofemoral thrombosis, and only those with the first onset of symptoms <10 days, were operated and analyzed. All patients underwent outpatient clinical investigation for PTS and duplex ultrasound to prove patency of the deep vein system. Assessment of QoL was performed using the VEINES-QoL/Sym questionnaire and the status of PTS was evaluated using the VILLALTA-scale.

Results: Within a 9-year period, 21 patients underwent surgical thrombectomy for acute IFDVT. Primary technical success was 100%. During follow-up (median 6 years), 19 patients (90.5%) presented patent iliofemoral veins without signs of re-thrombosis, two patients (9.5%) died of cancer without signs for recurrent IFDVT. 13 of 19 patients (68.4%) received analysis for QoL and PTS after surgical thrombectomy for IFDVT during FU. In our series, VEINES-QoL was median 48.0 (range 37-51) and VEINES-Sym 45.0 (range 41-47). The VILLALTA score was median 2 (range 0-9). No patient in our study developed ulcers during long-term FU.

Conclusion: For the treatment of acute IFDVT, surgical thrombectomy is not commonly given as much importance as interventional techniques. Nevertheless, the surgical approach is successful and durable with low rates of PTS and high QoL scores, and presents an alternative treatment option for acute IFDVT in selected cases.

Outcome of total percutaneous endovascular aortic repair with Perclose ProGlide technique

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Objective: Since January 2014 the standard approach to endovascular aortic repair (EVAR) in our centre is percutaneous (pEVAR). We evaluated our single centre experience of this totally percutaneous access during abdominal and thoracic EVAR using the Perclose ProGlide device (PPD, Abbott Vascular).

Methods: Between January 2014 and December 2017 139 pEVAR were performed. Data from total 256 femoral access sites were retrospectively reviewed. For puncture the best area without calcification was assessed by CT scan previously, ultrasound controlled puncture was used in selected cases. The outer size of the access sheaths were 14 to 26 French. From 2014 to 2015 we delivered two PPD systems for each access site. After 2016 only in 16 French or more outer diameter two PPD were used. Artery calcifications and sheath size as predictive factors for failure, complications and additional PPD deployment were analyzed.

Results: We achieved adequate hemostasis in 250 of 256 (97,7%) access sites. In six access sites bleeding required a suture of the common femoral artery. In two access sites surgical revision became necessary because of ischemia caused by plaque rupture. Further complications were 2 stenosis, 13 local dissections of the common femoral artery and one arteriovenous fistula. None of these patients were symptomatic or needed further interventions. In 3 patients an aneurysm spurium could be identified by CT scan and was successfully treated by compression. In 18 sites additional PPD had to be delivered. There was no correlation to access size or calcification.

Conclusion: The primary technical success rate in total percutaneous access using the PPD for endovascular aortic repair is high. In our analysis we could not identify any factors limiting the percutaneous technique.

Risk factors for incident vascular graft infection

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Objective: Due to the aging population, reconstructive vascular surgery has become increasingly common, especially in elderly and comorbid patients. Vascular graft infections (VGI) are serious complications with a cumulative incidence rate of 1-6%, leading to increased morbidity and mortality. Previously described associations with VGI include groin incision, extended procedure time, comorbid conditions, and local wound infections. We aimed to identify potentially avoidable risk factors for VGI, which are important measures for improved future infection prevention strategies.

Methods: Participants of the prospective Vascular Graft Infection Cohort Study (VASGRA) with vascular surgery between January 2013 and June 2017 were included. Observation time was calculated from the time of vascular surgery until the VGI confirmation or last follow-up, whichever occurred first. Patient- and procedure-related variables were assessed by infection status using non-parametric tests. Risk factors for developing a VGI were assessed by using uni- and multivariable Cox proportional hazard regression models, adjusted for demographic factors.

Results: A total of 433, predominantly male (83.1%) patients with a median age of 71 years contributed to 401 person-years (PY). Thereof, 36 (8.3%) developed a vascular graft infection, amounting to an incidence rate of 8.9/100 PY

[95% CI 6.5-12.4]. Overall, 94.1% received perioperative antibiotic prophylaxis, in 92.4% of which cefuroxime was applied with a median application time of 35 minutes before incision [IQR 25-45]. However, the proportion of those receiving prophylaxis significantly differed between the infection and the control group (80% vs. 95.4%, $p < 0.001$). Perioperative prophylaxis showed protective effects on infectious complications (aHR 0.32 [95% CI 0.14-0.77], $p = 0.01$), associated with a lower infection prevalence (7% vs. 28%, $p = 0.002$). Open surgery was performed in 69.4% of the infection group and 34.8% of the control group ($p > 0.001$). Consequently, the median total procedure time within the infection group was significantly longer compared to the control group (4.83 vs. 2.93 hours, $p = 0.002$). Both open surgery (aHR 3.56 [95% CI 1.62-7.79], $p = 0.002$) and extended procedure time (aHR 1.11 [95% CI 1.01-1.21], $p = 0.023$) were found to be risk factors for VGIs (Figure 1).

Conclusion: Among vascular surgery patients, procedure-related factors, such as open surgical approach and extended procedure time, contribute to the risk of developing a VGI. In contrast, timely correct application of perioperative antibiotic prophylaxis showed a highly protective effect on VGI development. Beilage 1647.

Hydrogen sulfide limits the development of intimal hyperplasia in a mouse model of femoral wire injury and in human veins

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Objective: Mainstays of contemporary therapies for this arterial occlusive disease include angioplasties, stents, endarterectomies and bypass surgery. However, these treatments suffer from high failure rates due to re-occlusive vascular wall adaptations, namely intimal hyperplasia (IH). IH develops in response to endothelium injury, leading to inflammation, vascular smooth muscle cells (VSMC) dedifferentiation, migration and proliferation at the site of injury. Hydrogen sulfide (H₂S) is a ubiquitous signaling gazotransmitter, which exhibits antioxidant, anti-inflammatory, and vaso-relaxant properties. Thus, we hypothesized that H₂S could reduce IH formation.

Methods: WT male C57BL/6J mice submitted to femoral wire injury surgery to induce IH were treated with an H₂S donor (NaHS) in the drinking water. IH was measured 28 days post-surgery by histology. In addition, segments of great saphenous vein obtained from patients undergoing bypass surgery were maintained in culture ex-vivo for 7 days in presence of various H₂S donors (NaHS, GYY4137, diacetyltrisulfide). Finally, primary human umbilical vein endothelial cells (HUVEC) and primary human VSMC were treated in-vitro with the same H₂S donors to study cellular proliferation and migration.

Results: NaHS treatment significantly reduced IH development in the mouse model of femoral wire injury (Figure 1). Similarly, the various H₂S donors prevented the development of IH in vein segments ex-vivo. In vitro, the same H₂S donors stimulated human endothelial cells (HUVEC) migration and proliferation, while inhibiting migration and proliferation of primary VSMC (Figure 2).

Conclusion: Exogenous H₂S prevents IH formation in mice in-vivo and in human veins ex-vivo. Importantly, H₂S reduces VSMCs but stimulates ECs proliferation and migration. These data suggest that exogenous H₂S therapy could be used in human to minimize IH, thus limiting vascular reconstruction failure.

Beilage 1337.

The ACE inhibitor Zofenopril limits intimal hyperplasia in a mouse model of carotid artery stenosis

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Objective: About 400,000 vein grafts are used each year to bypass coronary and peripheral arterial occlusive disease with ~30% of the grafts failing in the first year because of intimal hyperplasia (IH). Re-occlusive IH lesions result in costly and complex recurrent end-organ ischemia, and often to loss of limb,

brain function, or life. Despite decades of IH research limited therapies are currently available. Among modifiable risk factors, systemic hypertension is an important driver of IH. Hydrogen sulfide (H₂S) is a gas easily identified by its distinctive odor of rotten eggs. While toxic at high levels, H₂S produced endogenously acts on the vasculature and the brain as a signaling molecule to reduce blood pressure and IH. Interestingly, zofenopril is a sulfhydrylated angiotensin conversion enzyme inhibitor, which reduces blood pressure but also releases H₂S. Here, we tested the hypothesis that zofenopril is more efficient than the classic ACE inhibitor enalapril in reducing IH.

Methods: Spontaneously hypertensive male Cx40 deleted mice (Cx40^{-/-}) and normotensive WT littermates were treated for with either S-zofenopril (H₂S donor) or enalapril (control) at doses of 10 or 6 mg/kg, respectively. Systolic blood pressure (SBP) was monitored by tail cuff plethysmography. Two weeks after the start of treatment, focal carotid artery stenosis surgery was performed to induce IH formation. IH was measured 28 days post-surgery by histomorphometry.

Results: In hypertensive Cx40^{-/-} mice, but not in WT mice, zofenopril and enalapril reduced BP to normal values. Interestingly, in Cx40^{-/-} mice, zofenopril and to a lesser extent enalapril, significantly reduced IH formation. Further studies are ongoing to confirm those data.

Conclusion: Our initial results show that exogenous H₂S in the form of Zofenopril significantly reduces IH, beyond its effect on reducing blood pressure. In patient suffering vascular occlusive disease, Zofenopril could be used as the first choice ACE inhibitor.

Bariatry and hernias

Appetite, glycemia, and entero-insular hormone responses differ between oral, gastric-remnant and duodenal administration of a mixed meal test after Roux-en-Y Gastric bypass

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Objective: Human studies that investigated the effect of gastrointestinal re-routing after Roux-en-Y gastric bypass (RYGB) on glycemic control used meal tests (MT) administered by mouth and by gastrostomy. Significantly higher insulin response was observed after oral route, which can be attributed to the early exposure of intestinal L-cells to undigested food (hindgut theory) or to the lack of stimulation of an un-identified duodenal anti-incretin pathway (foregut theory). Given that the intestinal hormonal response to nutrients is caloric-rate dependent, we hypothesized that the meal administration by gastrostomy might be biased by the intact pyloric function regulating gastric emptying. Therefore, we examined the appetite and metabolic responses after RYGB by three feeding routes, with an additional duodenostomy (Figure 1).

Methods: A standard liquid MT was administered orally, into the gastric remnant, or intraduodenally 6 months after RYGB in 1 patient, 2-times per each route. Changes in plasma glucose, insulin, glucagon-like peptide-1 (GLP-1), glucose-dependent insulinotropic peptide (GIP), peptide Y-Y (PYY), and appetite were measured pre- and up to 120 minutes postprandially. Hunger and satiety were measured on visual analogue scales.

Results: Results are presented on Figure 2.

Postprandial GLP-1 (26,523 pmol/l/min vs 28,801 pmol/l/min) and PYY (62,871 pg/ml/min vs. 73,276 pg/ml/min) responses were similar, whereas glucose, insulin, and GIP levels differed markedly after oral vs. intraduodenal feeding. Intraduodenal feeding prompted an intermediate appetite response (i.e., between oral and intragastric). For postprandial glucose, insulin, and GIP levels, the intraduodenal route was more similar to the intragastric than oral route (30 min insulinemia: gastric ≈60 pmol/l, duodenal ≈250 pmol/l, and oral ≈1615 pmol/l). Intragastric administration did not evoke changes in appetite, glucose, or insulin; however, it slightly increased GLP-1 and PYY, and moderately increased GIP.

Conclusion: This study is the first to compare metabolic responses to MT administered by three different routes after RYGB. Findings indicate that appetite and metabolic responses depend on the route by which nutrients enter

the gastrointestinal tract and that the remnant gastric emptying rate interferes with outcomes. Hence, intraduodenal meal administration should be used in future studies to circumvent this bias.

Beilage 1592.

Permanent, non-absorbable meshes for the treatment of open abdomen

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Objective: Open abdomen (OA) or laparostomy may be required in patients with abdominal sepsis or compartment syndrome. OA is associated with significant long-term morbidity including incisional hernia as a consequence of missing support of the abdominal wall. In this retrospective multicentre study the outcome of synthetic non-absorbable mesh implantation was assessed in patients with OA.

Methods: Consecutive patients with OA from two tertiary referral centers were included. Patients with non-absorbable, permanent mesh implantation (group 1) were compared with patients treated with vacuum-assisted closure and fascial traction without non-absorbable mesh (group 2). The primary outcome parameter was incisional hernia.

Results: A total of 139 patients were included in the study: 50 patients (36.0 per cent) in group 1 and 89 patients (64.0 per cent) in group 2. In-hospital mortality (9 and 20 patients, risk difference -4.5 (95 per cent c.i. -18.2 to 9.3 per cent), $p=0.665$) and intestinal fistula (11 and 16 patients, risk difference 4.0 (-10.0 to 18.0) $p=0.656$) did not differ between the two groups. In group 1, significant reduction of reoperations (adjusted incidence risk ratio 0.48 per 10 person days (95 per cent c.i. 0.39 to 0.58), $p<0.001$), duration of stay on intensive care unit (adjusted hazard ratio (aHR) 0.53 (0.36 to 0.79), $p=0.002$) and hospital stay (aHR 0.61 (0.040 to 0.94), $p=0.024$) were observed. Hernia-free survival was significantly increased in group 1 ($p=0.041$).

Conclusion: Implantation of a non-absorbable mesh decreases the number of re-operations, duration of hospital stay and the incidence of incisional hernias in patients with OA.

Does coagulopathy, anticoagulant or antithrombotic therapy matter in incisional hernia repair? Data from the Herniated Registry

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Objective: A considerable number of patients undergoing incisional hernia repair are on anticoagulant or antiplatelet therapy or have existing coagulopathy which may put them at higher risk for postoperative bleeding complications. Data about the optimal treatment of these patients are sparse. This analysis attempts to determine the rate of postoperative bleeding complications following incisional hernia repair and the consecutive rate of reoperation among patients with coagulopathy or receiving antiplatelet and anticoagulant therapy (higher risk group) compared to patients who do not have a higher risk (normal risk group).

Methods: Out of the 43,101 patients documented in the Herniated Registry who had an incisional hernia repair, 6,668 (15.5%) were on anticoagulant or antithrombotic therapy or had existing coagulopathy. The implication of that higher risk profile for onset of postoperative bleeding was investigated in multivariable analysis. Hence, other influential variables were identified.

Results: The rate of postoperative bleeding in the higher risk group was 3.9% ($n=261$) and significantly higher compared to the normal risk group at 1.6% ($n=564$) (OR = 2.001 [1.699; 2.356]; $p<0.001$). Additionally, male gender, use of drains, larger defect size, open incisional hernia repair, lower BMI, and higher ASA score significantly increased the risk of postoperative bleeding. The rate of reoperations due to postoperative bleeding was significantly increased in the higher risk group compared to the normal risk group (2.4 % vs. 1.0 %; OR = 1.217 [1.071; 1.382]; $p=0.003$).

Conclusion: The rate of postoperative bleeding in the higher risk group was 3.9% ($n=261$) and significantly higher compared to the normal risk group at 1.6% ($n=564$) (OR = 2.001 [1.699; 2.356]; $p<0.001$). Additionally, male gender, use of drains, larger defect size, open incisional hernia repair, lower BMI, and higher ASA score significantly increased the risk of postoperative bleeding. The rate of reoperations due to postoperative bleeding was significantly increased in the higher risk group compared to the normal risk group (2.4 % vs. 1.0 %; OR = 1.217 [1.071; 1.382]; $p=0.003$).

Endoscopic component separation (ECS) enabling tensions-free closure of large ventral hernia

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Objective: The aim of ventral hernia repair is complete reduction of the hernia and tension-free closure of the abdominal wall. In large hernias (transverse diameter > 10 cm, EHS classification W3) unproblematic closure of the abdominal wall is mostly not possible and demands further surgical actions, such as component separation (CS) techniques. Due to the extensive subcutaneous tissue dissection during conventional open CS (Ramirez), repair of large ventral hernias is associated with an increased risk of wound complications and subsequent high in-hospital morbidity, costs and long hospital stay (LOS).

Methods: With the aim of reducing the extend of the tissue dissection for CS, we implemented an endoscopic component separation (ECS) as the standard approach for CS, if necessary in the repair of large ventral hernias. The concept of ECS is a minimally-invasive approach to the plane between internus and externus oblique muscles on each side, followed by an endoscopic dissection of the medial aspect of the externus oblique muscle fascia lateral to the linea semilunaris (figure 1).

Results: We present a video of a 58-year-old male patient undergoing ECS and open incisional hernia repair using sublay mesh augmentation for a large incisional hernia with additional stoma take down and intestinal reconstruction. Duration of the surgery was 280 min, ECS took 30 min for both sides. No intraoperative or postoperative complications were monitored. Patient was discharged on POD 8.

Conclusion: ECS is an alternative to conventional open CS techniques with the potential of less surgical wound morbidity.

Long-term weight loss after Roux-en-Y gastric bypass is independent from age at baseline

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Objective: Several comparative studies have suggested that, despite overall satisfactory results, Roux-en-Y gastric bypass (RYGBP) was associated with less weight loss in older compared to younger patients. The aim of the present study was to analyze 10-year weight loss and metabolic results of RYGBP in a large cohort of consecutive patients in relation to patient age at surgery.

Methods: Retrospective analysis of a prospectively maintained common bariatric database in two reference bariatric centers. Comparisons regarding total weight loss (%TWL), excess BMI loss (%EBMIL), serum glucose and lipid values were made using ANOVA between patients aged 39 years or less (Group A), 40 to 54 (Group B), and 55 or more (Group C).

Results: A total of 822 patients operated between 1999 and 2007 were included, 621 females and 201 males. Groups A, B, and C include 398, 337, and 87 patients respectively. Follow-up at 10 years was 75,5 %. Comorbidities were more common and length of stay longer in Group C. Group A had the highest %TWL and %EBMIL throughout the study period, but the difference was significant only until Year 6. There was no significant difference in %TWL or %EBMIL at any time point between groups B and C. As a result, BMI did not differ between groups after 10 years. 10-year lipid values did not differ between groups, but mean glycemia remained significantly higher at 10 years in Group C.

Conclusion: Results of RYGBP are better during the first 5-6 post-operative years in younger patients, but the differences fade away after 10 years. Lipid profile improvement was similar throughout age groups, whereas glycemic control remained better in younger patients. Age should not be a limiting factor for access to bariatric surgery, and notably to RYGBP, in patients with severe adiposity-related disorders.

Internal hernia after gastric bypass, how to close the windows by laparoscopy

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Objective: Internal hernia after gastric bypass is a frequent post-operative complication with an incidence estimated between 1-4%. Internal hernia can lead to intestinal necrosis and so represent a complication with potentially major consequences. The aims of this video is to illustrate the technic of post bypass window closure in case of internal hernia after gastric by-pass.

Methods: Presentation of the different types of internal hernia after gastric by-pass and a video of laparoscopic procedures to close the windows in some cases of internal hernia.

Results: Laparoscopic procedure to reduce internal hernia and close the windows is a safe procedure but has to be trained and taught in a standardized manner.

Conclusion: This operation must be learned and trained by bariatric surgeons but also by general surgeons. This video show our laparoscopic procedure of hernia reduction and closure of the windows designated as a teaching video.

Thorax

Preliminary results and experiences from a screening program for lung cancer in a high risk population

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Objective: Lung cancer is nowadays the major cause of cancer deaths among both men and women, showing an upward trend in the last decades, mostly due to the advanced stage at the time of diagnosis. The National Lung Screening Trial (NLST), published in 2011, managed to show that the screening with low-dose chest-CT in a high risk population could reduce mortality through a shift of the lung cancer stages at the time of diagnosis. The value of such a screening program in order to detect lung cancer cases at an earlier stage remains to be proven.

Methods: From February 2016 to July 2017, 598 persons at high risk for lung cancer were enrolled. The participation in the screening program was optional and the participants were informed through advertisements in the media and newspaper. Included were smokers, ex-smokers and never-smokers older than 50 with 1 of the following criteria: i) >20 packyears, ii) history or active ENT-tumor, iii) chronic exposition to passive smoking, radon, dieselparticles or dieselgas, iv) family history of two or more first grade relatives that suffered from lung cancer. All participants underwent a screening examination with low-dose chest-CT. Data were collected in regard to pulmonary nodules or other lung abnormalities, as well as abnormal findings from other organs such as kidney, liver, breast and coronary vessels.

Results: A total of 140 persons (23.4%) showed positive screening results and were further evaluated. 118 (84.3%) and 12 (8.6%) underwent a low-dose chest-CT after 3 and 1 month respectively. After the further examinations 12 patients with abnormal findings from other organs and 4 patients with benign pulmonary findings were referred for further assessment. The histological diagnosis of NSCLC was set in 4 patients (0.66%), three of which were operated and one was treated with chemotherapy (Stage IIIB).

Conclusion: Screening for lung cancer as every screening examination imposes benefits and bears certain risks. Overdiagnosis, overtreatment and possible harm due to radiation are some of them. Moreover certain technical details such as the interval between screening tests and the criteria to define abnormal findings will have to be re-assessed, in order to target the population that will profit the most. Nevertheless the need for a wide screening program for lung cancer is inevitable.

Excess of brain imaging in stage IA Non-Small Cell Lung Cancer (NSCLC): An underestimated cost factor

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Objective: There is a controversy between the different guidelines regarding the role of brain imaging in the staging of stage IA NSCLC. The National Comprehensive Cancer Network (NCCN) does not recommend brain imaging for patients without neurological symptoms, whereas the British Thoracic Society recommends brain imaging for all patients considered for curative therapy. Aim of this study was to investigate the adherence to the aforementioned guidelines including the subsequent influence on patient outcome in our tertiary care center.

Methods: All patients with NSCLC treated at our institution from 2012 to 2015 were included in this study. The 7th lung TNM classification and staging system was used.

Results: 504 patients were included in our study with a median age of 67 years. The predominant cell types were adenocarcinoma in 296 patients and squamous cell carcinoma in 173 patients. There were 101 stage IA and 403 stage IB-IV. Among asymptomatic clinical stage IA patients, 44 had initial brain imaging despite missing neurological symptoms whereas 57 did not. None of these patients was found to have metastasis. 84 patients with higher tumor stages showed neurological symptoms and therefore had brain imaging, showing cerebral metastasis in 59 patients (70.2%). There was no difference in the detection rate between CT-Scan and MRI (p=0.64). Among the remaining asymptomatic patients who did not receive any initial brain imaging (n=183), 2 eventually developed brain metastasis. One patient suffered from a stage IIIB NSCLC and was a non-responder to palliative radiochemotherapy. The second patient needed an emergency lobectomy because of sepsis secondary to poststenotic pneumonia (stage IIA). Only 11/70 patients (15.71%) with brain metastasis did not show any initial neurological symptoms. They were all N+ except for two patients.

Conclusion: Brain imaging did not lead to an upstaging in stage IA patients, confirming the recommendations of the NCCN. If we consider all brain studies done in this cohort, there was a potential cost saving of 30'800 CHF. This should motivate a better adherence to the established guidelines.

Initial experience, clinical and oncological outcome of 100 consecutive uniportal pulmonary segmentectomies

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Objective: Prospective evaluation of clinical short-term outcomes on one hand and oncological long-term outcomes of uniportal segmentectomies on the other hand.

Methods: Retrospective analysis of all patients that underwent single-port anatomical segmentectomy from 04/2015 to 03/2017 at our institution.

Results: A total of 100 patients, 60 of them men with a mean age 65.5 years, underwent a uniportal pulmonary segmentectomy. Diagnoses were bronchial carcinoma (n=73), metastasis (n=16) and benign lesions (n=11). Besides resection of one single lung segment (n=64), 16 bi-segmentectomies, 17 tri-segmentectomies and 3 resections of 4 lung segments were performed. No conversions to multiport VATS or thoracotomy were necessary. Primary lung tumour types were adenocarcinoma (n=51, 69.9%), squamous cell carcinoma (n=13, 17.8%), neuro-endocrine tumors (n=7, 9.6%) and SCLC (n=2, 2.7%). T-stages were: pT1 (n=48, 65.7%), pT2 (n=21, 28.7%) and pT3 (n=2, 2.7%).

Mean tumor size was 18.1 mm (± 9.2 , range 2–44 mm). All patients underwent systematic regional and mediastinal lymph node dissection with a mean number of extracted lymph node stations 3.46 ± 1.77 and number of lymph nodes 10.7 ± 7.9 . Nine patients (12.3%) were nodally upstaged. The 30-day mortality and morbidity rates were 1% and 10%, respectively. One patient died from acute bleeding from a pre-existing duodenal ulcer despite emergency laparotomy. Postoperative complications included pneumonia ($n=4$), prolonged air leak ($n=5$) as well as one patient with postoperative hemothorax, who was successfully treated with a chest tube. The median duration of chest tube was 1 day (range 0–16 days) and the median length of hospital stay was 3 days (range 1–40 days). In the mean follow-up time of 15.9 months (9–33): 2 patients showed local recurrence and 2 patients presented with a recurrence involving another lung lobe, all of them underwent curative lobectomy. 2 patients died because of recurrence of a pre-existing ENT tumour and 2 patients died because of metastasis of NSCLC without signs of local recurrence.

Conclusion: Uniportal anatomical segmentectomy is a safe and effective surgical alternative to traditional lung resections. Short-term clinical outcomes are promising and the long-term oncological outcome remains to be further assessed in the years to come.

Oncological outcome after surgery for NSCLC: a 10 year single center experience

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Objective: Surgery is the mainstay of treatment for early stages of NSCLC. Within the last decade the introduction of VATS anatomical lung resection (AR) has notably influenced surgical strategies. We here report the oncological outcome of AR for NSCLC during a 10 year period.

Methods: Single center retrospective cohort study including consecutive patients undergoing AR for NSCLC from January 2006 to December 2015. Patients with AR for recurrent or metachronous NSCLC or incomplete follow-up were excluded. Kaplan–Meier estimates were applied for analysis of overall and disease-free survival (OS, DFS).

Results: 1044 patients had AR for malignant disease, 868 pts for NSCLC, 559 eligible patients were enrolled. Mean follow up was 5 years. From 2006 to 2009 AR was performed in all patients by thoracotomy. Thoracotomy rate decreased progressively from 2010 to 2015 (91, 65, 59, 47, 49, 36%). Pathological stage 1-year / 5-year OS (%) were 87/77 (IA), 88/67 (IB), 91/52 (IIA), 75/31 (IIB), 79/59 (IIIA), 50/25 (IIIB) before 2010 and 99/92 (IA; $p < 0.05$), 94/69 (IB; ns), 84/59 (IIA; ns), 85/52 (IIB; ns), 89/55 (IIIA; ns), 58/23 (IIIB; ns) thereafter. DFS was not significantly different in patients undergoing surgery before or after 2010.

Conclusion: Today VATS anatomical lung resection can replace open resection of NSCLC in the majority patients. The introduction of a VATS program has no negative impact on survival of patients undergoing lung resection for NSCLC.

An Enhanced Recovery after Surgery (ERAS) program for video-assisted thoracoscopic anatomical lung resections is cost-effective

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Objective: Enhanced recovery after surgery (ERAS) programs have been reported to decrease complications and hospital stay after lung resection, but

implementation requires time and financial investment with a dedicated clinical nurse. The aim of this study was to evaluate the clinical and economic outcomes for video-assisted thoracoscopic surgery (VATS) anatomical pulmonary resection before and after ERAS implementation.

Methods: The first 50 consecutive patients undergoing VATS lobectomy or segmentectomy for malignancy after implementation of ERAS program were compared with 50 consecutive patients treated before its introduction. The ERAS protocol consisted on preoperative counseling, reduced preoperative fasting with preoperative carbohydrate loading, avoidance of premedication, standardized surgery and postoperative analgesia, early removal of chest tube, nutrition and mobilization. Length of stay, readmissions and cardio-pulmonary complications within 30 days were compared. Total costs were collected for each patient and a cost-minimization analysis was calculated while integrating ERAS-specific costs.

Results: The 2 groups were similar in terms of demographics and surgical characteristics (table 1). The ERAS group had significantly shorter postoperative length of stay (median: 4 days; vs 7 days, $p < 0.0001$), decreased pulmonary complications (16% vs 38%; $p = 0.012$) and decreased overall post-operative complications (24% vs 48%, $p = 0.031$). One patient was readmitted for each group and there was no 30-day mortality. ERAS-specific costs were calculated as 664€ per patient including the costs related to dedicated nurse, database and carbohydrate drinks. Mean total hospitalization costs were significantly lower in ERAS group (15945€ vs 20360€, $p < 0.0001$), mainly related to lower costs for the post-operative period (7449€ vs 11454€, $p < 0.0001$) in comparison with intra-operative period (8496€ vs 8906€, $p = 0.303$). Cost-minimization analysis showed a mean saving in the ERAS group of 3751€ per patient.

Conclusion: ERAS program for VATS anatomical resection is associated with lower complication rates, shorter postoperative length of stay and is cost-effective even during implementation.

Beilage 1254.

Improved right ventricular function after Nuss procedure in adults assessed by transesophageal echocardiography

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Objective: Open surgical correction of pectus excavatum (PE) has been shown to result in improved cardiac function. In this study we assess the impact of minimal invasive repair of PE on right ventricular (RV) function in adults.

Methods: Retrospective case study including 16 patients (age 16–25 years, median 18) undergoing Nuss repair of PE between 2013 and 2017. Intraoperative transesophageal echocardiography was performed under general anesthesia before and after surgery to assess end-diastolic RV area and volume. Four-chamber and RV inflow-outflow views were used; RV volume was calculated from these data.

Results: The end-diastolic RV area and RV volume significantly increased after successful elevation of the sternum with bar placement (14.5 ± 5.1 cm² versus 18.4 ± 5.4 cm² ($p = 0.0003$) and 27.3 ± 13.8 ml versus 37.9 ± 17.3 ml ($p = 0.004$); mean value \pm SD).

Conclusion: The Nuss procedure significantly increases RV filling and may thereby improve cardiopulmonary function after surgical repair of PE.

Low dose photodynamic therapy improves tumor vascular pericyte coverage and promotes chemotherapy distribution in malignant pleural mesothelioma

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Objective: Vascular-targeted low-dose photodynamic therapy (photoinduction) decreases interstitial fluid pressure and improves chemotherapy distribution in malignant pleural mesothelioma (MPM). However, the cellular and molecular events triggered by photoinduction in the tumor vasculature are currently unknown. Tumor vessels are structurally and functionally abnormal with

high intrinsic permeability, low pericyte coverage and less efficient transport capacity in comparison to normal vessels.

Methods: Here, we hypothesized that pericytes play a central role in the tumor vascular modulation following photoinduction. We determined the impact of photoinduction on the pericytes of two different MPM xenograft models grown in rodents. We then determined the impact of photoinduction on the cytoskeleton regulation/activation of pericytes in pericyte/endothelial cell co-cultures in vitro.

Results: Intravital microscopy revealed that that tumor vascular density, vessel diameter and blood flow were not affected after photoinduction over a period of one hour. However, we found that photoinduction caused a specific and significant drop in tumor interstitial fluid pressure which was associated with enhanced tumor vessel pericyte coverage. This resulted in an enhanced high molecular weight FITC-dextran transport in tumors. Furthermore, photoinduction applied on human pericyte and endothelial cell co-cultures had no effect on endothelial cells, but caused pericyte activation which exhibited cytoskeletal remodeling and enhanced collagen gel contraction capacity. Molecular analysis revealed that pericyte activation following photoinduction occurred through RhoA activation and myosin light chain phosphorylation.

Conclusion: Our study reports a potential mechanism whereby photoinduction stabilizes tumor vessels through pericyte cytoskeletal remodeling, leading to tumor interstitial fluid pressure drop with improved convection and enhanced distribution of subsequently administered macromolecular compounds. Therefore, our findings suggest key cellular and molecular pathways involved in photoinduction which may help optimize and translate this approach in patients.

Cancer stem cell plasticity in the NSCLC cell line A549

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Objective: More than 80% of lung tumors are non-small-cell lung cancers (NSCLC). Cancer stem cells (CSCs) are characterized by an increased expression of stemness-associated genes, and drive tumor initiation and therapy resistance. Cell lines are essential tools to standardize and compare experimental findings in basic and translational cancer research. Here, we identified and comprehensively characterized three morphologically distinct cellular subtypes in the NSCLC cell line A549.

Methods: Whole genome mRNA expression was analyzed by Illumina HiSeq3000 2x 150 bp paired end sequencing. Protein expression was analyzed by multicolor flow cytometry and immunofluorescence microscopy. Mouse studies were conducted in accordance with Institutional Animal Care and Ethical Committee-approved animal guidelines and protocols. Immunohistochemical staining was performed using an automated Bond III immunostainer.

Results: Subtype-specific cellular morphology is maintained during short-term culturing, resulting in the formation of morphologically distinct colonies (holoclonal, meroclonal and paraclonal colonies). A549 holoclone cells were characterized by an epithelial and stem-like phenotype, paraclone cells featured a mesenchymal phenotype whereas meroclone cells were phenotypically intermediate. Cell-surface marker expression of subpopulations changed over time, indicating an active epithelial-to-mesenchymal transition (EMT), in vitro and in vivo. EMT has been associated with the overexpression of the immunomodulators PD-L1 and PD-L2, which were overexpressed in para- versus holoclone cells, respectively. We found that DNA methylation is involved in epigenetic regulation of marker expression. Holoclone cells were extremely sensitive to cisplatin- and radiotherapy in vitro, whereas paraclone cells were highly resistant. Xenograft tumor formation capacity was highest in holoclone cells. Our results show that A549 subpopulations might serve as a

unique system to explore the network of stemness, tumor initiation capacity, invasive and metastatic potential and chemo/radio-therapy resistance.

Conclusion: Our protocol for isolating subpopulations from the A549 line might provide a unique system to study the network of stemness, tumor initiation capacity, invasive and metastatic potential and therapy resistance.

Upper gastrointestinal tract

Radiation dose in the neoadjuvant treatment of esophageal cancer; how much is too much?

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Objective: Current management guidelines of locally advanced oesophageal cancer suggest a clear survival benefit for neoadjuvant treatment (NAT) and surgery over surgery alone. Although chemotherapy regimens are being subject to major clinical studies, no robust data exist as to the optimal radiation dose. Aim of the present study was to assess the impact of radiation dose on short- and long-term postoperative outcomes.

Methods: All consecutive patients operated for esophageal cancer that received neoadjuvant chemoradiation between 2000-2016 were assessed. Emergency surgery, definitive chemoradiation, and radiation dose <41.5Gy or >50.4Gy were excluded from analysis. Postoperative complications and long-term survival were compared among three groups of patients: Group A (NAT with 41.4Gy), Group B (NAT with 45Gy), and Group C (NAT with 50.4Gy). The χ^2 or Fisher tests were used for categorical variables and ANOVA for continuous variables. Survival analysis was performed with Kaplan–Meier method, using the log-rank test.

Results: During the study period, 137/276 (49.6%) patients received neoadjuvant chemoradiation and 114 fulfilled the inclusion criteria. There were n = 25, 34 and 55 patients in Groups A, B and C respectively, with no differences in histology, preoperative stage or surgical approach. Patients in group C had significantly less platinum/taxol based chemotherapy (55.8%) than those in group A (68%) and B (79.4%) (p = 0.0049). Major postoperative complications, mortality, length of stay but also specific complications such as anastomotic leakage, cardiac arrhythmia and pneumonia presented no significant inter-group differences. Complete or excellent response to treatment (TRG 1-2) was significantly lower for group A (21.7%) than groups B (54.5%) and C (56.9%) (p = 0.014), while R0 resection rates were similar. Median survival was 94 months for group A, 39 months for group B and 29 months for group C, however the difference was not statistically significant (p = 0.306).

Conclusion: Radiation dose during NAT for esophageal cancer was not associated to increased postoperative complications and mortality. Despite a higher rate of complete/excellent response to NAT for patients receiving 45 or 50.4Gy compared to 41 Gy, this did not translate to a significant survival benefit.

Presence of lymph node metastases is the most relevant prognostic factor in esophageal carcinomas after neoadjuvant treatment and transmediastinal esophagectomy

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Objective: Neoadjuvant treatment (nRCT) has been successfully implemented in the therapy of locally advanced esophageal and gastro-esophageal carcinomas. The prognostic impact of findings obtained from the resection specimens, including TNM relevant factors, may differ from those of primary resected, treatment naive tumors.

Methods: Clinicopathologic features from a consecutive case series of 187 carcinomas of the esophagus and gastroesophageal junction were retrospectively evaluated including 139 adenocarcinomas, treated with nRCT and transmediastinal esophagectomy (TME). TNM staging was performed according to the

current 8th edition of the UICC TNM classification. Tumor regression grade (TRG) was determined using the Becker system, which describes the percentage of residual tumor cells in relation to the previous tumor site.

Results: Fifty one tumors (27.1%) showed complete regression (TRG 1a), 74 (39.4%) <10% residual tumor (TRG 1b), 29 (15.4%) 10–50% residual tumor (TRG 2) and 33 (17.6%) >50% residual tumor (TRG 3). There was no difference between adenocarcinomas and squamous cell carcinomas regarding tumor regression. There was a significant correlation between TRG and ypT category, ypN category and lymphovascular invasion ($p < 0.001$). Of note, lymph node metastases were still detectable in 8/51 cases with TRG 1a and 24/74 cases with TRG1b. TRG, ypT category, ypN category, lymphovascular invasion, presence of distant metastases and R-status were all associated with overall survival in univariate analysis ($p < 0.001$ each). Multivariate analysis revealed ypN category (HR = 1.6; $p = 0.035$) as only independent prognostic factor.

Conclusion: Current nRCT protocols achieve high rates of complete or subtotal tumor regression of the primary tumor in esophageal carcinomas. Presence of lymph node metastases, that can be observed even in these cases, is the most relevant prognostic factor.

The influence of ABO blood type on incidence and survival after esophagectomy for esophageal cancer

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Objective: ABO blood type (BT) has been described as prognostic factor to predict incidence and survival of different malignancies. The topic remains controversial, and most evidence comes from Eastern populations with squamous cell esophageal carcinoma. The aim of the present study was to evaluate the role of ABO blood type on incidence and survival of esophageal cancer in an European population.

Methods: Four European esophageal cancer centers joined their institutional databases. A total of 463 patients (305 adenocarcinoma (AC), 158 squamous cell carcinoma (SCC)) who underwent oncological esophagectomy from 2000 to 2017 were included. Cox proportional hazard regression analysis and Students test have been used. Mean follow-up was 29.2 months (range 1 – 184 months).

Results: BT 0 was mostly associated with AC (70%) and positive lymph nodes (76%); BT A has the most SCC (39%). In SCC, blood type B has the most positive lymph nodes (35%). There was no significant correlation of tumor stage to ABO BT. Mean disease free survival was 15.4 months for BT A, 8.9 months for BT B, 9.4 months for BT AB, and 12.5 months for BT 0 ($p = 0.882$). Mean overall survival was 29.5 months for BT type A, 27 months for BT B, 27 months for BT AB, and 29.4 months for BT 0 respectively ($p = 0.839$).

Conclusion: In Western patients, ABO blood type is not a significant risk factor for any type of esophageal cancer and its related survival.

Robotic assisted minimal invasive esophagectomy is safe and reduces the length of hospital stay compared to open transthoracic esophagectomy

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Objective: The perioperative complication rate in esophageal surgery remains considerably high. The robotic assisted minimal invasive esophagectomy (RAMIE) is one of the promising innovations in esophageal surgery, which might improve the perioperative results. We have developed a completely minimal invasive robotic assisted operation technique and assessed its safety and effectiveness compared to the traditional open transthoracic operation technique.

Methods: All patients undergoing surgery for esophageal cancer between 2015–2017 were included in the study. Patient's characteristics, perioperative

complication rate, rate of resected lymph nodes, length of intensive care unit and hospital stay were assessed prospectively.

Results: 36 patients undergoing open transthoracic esophagectomy (OPEN) were compared to 9 patients undergoing RAMIE. The age and Charlson Index of both groups were comparable. The mean number of resected lymph nodes was 23.1 in the RAMIE versus 20.3 in the OPEN group. The mean operative time was longer in the RAMIE group (395 vs. 294 min.). The mean length of stay in the intensive care unit and in the hospital was longer in the OPEN group (110 vs. 59 hours and 24 vs. 19.3 days). The severity of complications was higher in the open group (2.44 vs. 1).

Conclusion: Minimal invasive robotic esophagectomy is feasible and safe. The operative time is longer, but the perioperative morbidity seems to be lower, which results in shorter length of stay in the intensive care unit and hospital.

A propensity-adjusted cost and outcome comparison of per-oral endoscopic myotomy to laparoscopic Heller myotomy

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Objective: In many centers initiating Per-Oral Endoscopic Myotomy (POEM) programs, outcome comparisons to laparoscopic Heller myotomy (LHM) are ongoing, but often compare unmatched patient populations. The aim of the present study was to compare perioperative and short-term outcomes, and costs between the two procedures after propensity score matching.

Methods: A prospective IRB approved database documented all patients undergoing LHM (since 2001) and POEM (since 2015). Eighteen preoperative variables were used to create propensity matched groups. Perioperative data, pre- and 3-month-postoperative Eckardt Scores and esophagogram results were compared. Cost analysis accounted for the yearly cost progression.

Results: Thirteen pairs were matched. In the matched cohort, operative time (152 ± 52 min vs. 160 ± 12 min, $p = 0.7$) and myotomy length (7.2 ± 2 cm vs. 7.5 ± 1 cm, $p = 0.7$) were comparable between POEM and LHM, while POEM was associated with a reduced hospital stay (1.3 ± 0.5 days vs. 2 ± 0.7 days, $p = 0.01$). Complications grade 1 and 2 according to the Clavien-Dindo classification occurred in 1 and 4 patients after POEM and LHM, respectively. One patient was readmitted within 30 days in each group with no 30-day mortality. Median Eckardt scores improved significantly after POEM (4 to 0) and LHM (4 to 0.5). Post procedure esophagograms demonstrated similar improvement. Normalized costs were comparable but showed an increased variability for POEM (POEM: 15834 (12776–21754) USD vs. LHM: 16504 (14957–17606) USD, $p = 0.7$).

Conclusion: After adjusting for preoperative variables, POEM demonstrates shorter hospital stay and comparable clinical outcomes and costs to LHM. The increased cost variability might indicate that cost efficiency can potentially be improved with POEM.

Clinical, endoscopic and radiological outcome of laparoscopic large hiatal hernia repair

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Objective: Large hiatal hernia repair shows high recurrence rates, however, the quality of the literature is moderate due to a substantial heterogeneity. Surgical procedures and follow-up schemes differ within and between reports. The aim of this study was to determine clinical, endoscopic and CT-scan based outcome of standardized large hiatal hernia repair.

Methods: Prospective follow-up of all patients undergoing surgery due to large hiatal hernia, defined as >20% of the stomach intrathoracically, was conducted. Using a 4-port technique, the stomach was repositioned, posterior suture of the right crural pillars with mesh enforcement (Parietex™ Covidien), reconstruction of the angle of His and an anterior 180°-fundoplication was

performed. Follow-up entailed upper endoscopy at 3 months, and clinical evaluation and computed tomography of the hiatus at least 12 months postoperatively.

Results: Between 2012 and 2016, 40 consecutive standardized, primary large hiatal hernia repairs were performed. Mean age was 70.9 +/- 10.1 years, 57.5% of the patients were female. The predominant pre-operative symptoms were reflux in 57.5%, dyspnea in 35% and regurgitation in 30%. Mean operation time was 134 +/- 39 minutes, mean length of hospital stay 4.4 +/- 1.6 days, respectively. There were no conversions. There was one intraoperative pneumothorax treated with a pleural catheter and one early re-operation due to fundus migration on the second day. Upper endoscopy 3 months postoperatively showed a correct position of the wrap in 37 patients and a cardia insufficiency in one patient. 2 patients neglected upper endoscopy. In the CT scan, 33 (82.5%) patients showed a good position of the fundoplication, 4 (10%) had a partial intrathoracic slippage of a portion of the fundus (3 asymptomatic, 1 needed proton pump inhibitors (PPI)) and 3 (7.5%) had a recurrent hernia (2 asymptomatic, 1 needed PPI). Due to the lack of symptoms, no revisions were performed. 80% of the patients rated the clinical outcome as excellent, 15% as good and 5% as fair. 97.5% would undergo surgery again.

Conclusion: Large hiatal hernia repair with mesh-augmented dorsal suture of the right crural pillars, reconstruction of the angle of the His and anterior 180° fundoplication shows excellent clinical results and good radiological outcome with an overall recurrence rate of 7.5% and partial wrap slippage of 10%.

Overall survival for non-metastatic patients with gastric cardia cancer is better after neo-adjuvant chemotherapy compared to neo-adjuvant radio-chemotherapy: A population-based analysis using NCDB

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Objective: The primary aim of this study was to assess whether neo-adjuvant chemotherapy (neo_ChT) or neo-adjuvant radio-chemotherapy (neo_RChT) is superior concerning overall and relative survival in patients with non-metastatic gastric cardia cancer.

Methods: The National Cancer Data Base (NCDB) was reviewed from 2006 to 2014 to identify non-metastatic gastric cardia cancer patients who underwent surgical resection and were treated with neo_ChT or neo_RChT. Overall and relative survival was assessed using unadjusted and multivariable adjusted Cox proportional hazard regression analyses. Advanced statistical modeling was applied to further account for inherent differences between the two groups by exact weighted propensity score adjustment while causal inference by near-far-matching was performed to account for unmeasured bias.

Results: Of the 5528 patients included, 4361 (78.9%) underwent neo_RChT and 1167 (21.1%) underwent neo_ChT. Most patients were male (n=4656, 84.2%), mean age was 61.2 years (SD 10.0). Comorbidities were similarly distributed between the two groups (p=0.64). Treatment strategies did not change over time. Patients who received neo_RChT more often had an R0 resection compared to neo_ChT (91.1% vs. 86.5%, p<0.001, respectively). Unadjusted 5-year OS rates were 39.8% (95%CI: 38.1-41.6) for neo_RChT and 40.6% (37.5-44.0) for neo_ChT (p=0.17). In multivariable adjusted analyses, patients treated with neo_ChT had better overall survival compared to neo_RChT (HR: 0.91, 95%CI: 0.83-1.00, p=0.046). This survival difference persisted after propensity score adjustment (HR: 0.91, 95%CI: 0.82-1.00, p=0.045) [figure], and even after assessing causal inference by near-far-matching (HR: 0.87, 95%CI: 0.76-0.98, p=0.024). Patients with stage III disease, G3/4 tumors, positive resection margins, more comorbidities, and older patients (>65 years) had worse overall survival compared to their counterparts (p<0.05 for all comparisons). After multivariable adjustment, relative survival was better after neo_ChT compared to neo_RChT (HR: 0.90, 95%CI: 0.82-1.00, p=0.037).

Conclusion: The results of this study support the use of neo_ChT over neo_RChT among patients with localized gastric cardia cancer. Prospective randomized trials comparing neo_ChT with neo_RChT among gastric cardia cancer patients is definitely needed to finally define the best treatment strategy among those patients.

Oncologic outcomes of robotic total gastrectomy compared with laparoscopic total gastrectomy for gastric cancer

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Objective: Minimal invasive gastrectomy shows a slower adoption in western countries compared to asia probably due to lower incidence, advanced stages and a more frequently proximal localisation which requires a total gastrectomy. We would like to assess the oncologic outcome of the robotic total gastrectomy compared to the laparoscopic total gastrectomy including advanced gastric cancer in a high volume tertiary hospital.

Methods: We retrospectively reviewed a prospectively collected database. A total of 475 patients including 164 robotic and 311 laparoscopic total gastrectomies of stage pT1-T4a were identified from 2005 until 2013. Perioperative outcomes as well as 2-year oncologic outcomes were compared. Survival analyses were performed after exclusion of 18 patients (2 for perioperative mortality and 16 for concurrent cancer) for a total of 457 patients.

Results: The age of the robotic group was significantly younger than the one of the laparoscopic group (54.1±11.8 versus 58.9±11.7, respectively, p<0.001). Most tumors were localised in the upper body in both groups (102 (62.2%) versus 171 (55%), respectively, p=0.356). In terms of tumordepth, the majority of tumors in both groups were of stage pT1 (110 (67.1%) versus 211 (67.8%), respectively). Tumors were more advanced in the robotic group compared to the laparoscopic group (pT3: 21 (12.8%) versus 21 (6.8%); pT4a: 16 (9.8%) versus 27 (8.7%), respectively, p=0.104). More signetringcellcancer (49 (29.9%) versus 72 (23.2%)) were found in the robotic group without statistical significance. In regards of Lauren classification, significantly more diffuse type cancers were found in the robotic group (86 (52.4%) versus 117 (37.6%), p=0.026). Mean numbers of retrieved lymphnodes were significantly higher in the robotic group (45.6±16.5 versus 40.1±14.9, p<0.001). Mean number of metastatic nodes was similar in both groups (1.2±3.7 versus 0.9±3.0, p=0.293). Median Follow up time was 60 months. The 2-year overall survival was 94.4% (95% CI 112.9-122.1) for the robotic group and 96.6% (95% CI 103.7-115.3) for the laparoscopic group. Kaplan Meier curves for overall survival showed no survival differences between the two groups (log-rank p=0.357).

Conclusion: The use of the robotic system did not show superiority of the oncologic results of total gastrectomy compared to the laparoscopic approach in a high volume center.

Perioperative chemotherapy with docetaxel, oxaliplatin, and fluorouracil/leucovorin (FLOT) versus epirubicin, cisplatin, and fluorouracil or capecitabine (ECF/ECX) for resectable gastric or gastroesophageal junction (GEJ) adenocarcinoma (FLOT4): A multicenter

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Objective: The MAGIC trial established perioperative (periop) epirubicin, cisplatin, and 5-FU (ECF) as a standard treatment for patients with operable esophagogastric cancer, but survival continues to remain poor. FLOT4 (NCT01216644) is a multicenter, randomized, investigator-initiated, phase 3 trial. It compares the FLOT with the ECF/ECX as a periop treatment for patients with resectable gastric or GEJ adenocarcinoma.

Methods: In the FLOT4, patients with resectable gastric or GEJ adenocarcinoma of stage ≥cT2 and/or cN+ (n=716) were randomized to either 3 pre-operative and 3 post-operative 3-week cycles of ECF/ECX (epirubicin 50 mg/m² i.v., cisplatin 60 mg/m² i.v., both on day 1, and 5-FU 200 mg/m² as continuous i.v. infusion or capecitabine 1250 mg/m² orally on days 1 to 21) or 4 pre-operative and 4 post-operative 2-week cycles of FLOT (docetaxel 50 mg/m² i.v., oxaliplatin 85 mg/m² i.v., leucovorin 200 mg/m² i.v., and 5-FU 2600 mg/m² as 24-hour i.v. infusion, all on day 1). The primary endpoint was overall survival.

Results: FLOT was associated with less progressive disease cases during/after preoperative therapy (1% vs. 5%; p<0.001), more R0-resections (84% vs. 77%; p=0.011), higher number of pT0/pT1 tumors (25% vs. 15%; p=0.001), longer progression-free (30 vs. 18 months; HR 0.75; p=0.001) and overall survival (50

vs. 35 months; HR 0.77; $p=0.012$) then ECF. The relative effect from FLOT was observed in all subgroups, including elderly and signet cell tumors, and was numerically pronounced in Siewert I esophageal tumors (HR 0.60), Barrett tumors (HR 0.62), small tumors T1/2 (HR 0.66) or nodal-negative tumors (HR 0.64). In multivariate analyses, parameters associated with favorable survival were FLOT therapy (HR 0.75, $p=0.006$); stomach as the primary (HR 0.74; $p=0.005$), and nodal negativity (HR 0.72, $p=0.022$). Post-hoc analyses of relapse-free survival (PFS excluding patients without R0-resection) still favored FLOT (HR 0.8; $p=0.049$). 87% of relapses were systemic or both systemic and locoregional. The most frequent sites of relapse were peritoneal (31%) followed by lymphatic (26%), and liver (19%).

Conclusion: Analysis confirmed the superiority of FLOT as the new standard for neoadjuvant chemotherapy in oesophagogastric adenocarcinoma. Patients derived benefit from FLOT even if they were old ($>=70$), had small tumors, a nodal negative status, or a signet cell component.

Assessment of bowel vitality with ICG fluorescence during surgery for ischemic small bowel obstruction: a video vignette.

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Objective: Intraoperative fluorescence imaging with indocyanine green (ICG) has been widely accepted as a reliable tool for assessment of bowel perfusion prior to construction of anastomosis. During surgery for small bowel obstruction (SBO), after adhesiolysis has been completed, the reversibility of any bowel ischemia may sometimes be hard to determine relying on clinical criteria alone. The ICG test could provide an additional simple, cheap and reliable tool to determine bowel vitality in this context.

Methods: This is a video case report illustrating the use of ICG to assess bowel perfusion in a patient undergoing laparoscopic adhesiolysis for acute SBO with bowel ischemia.

Results: A 70-year-old woman with no past medical or surgical history, presented with signs and symptoms of SBO since 24 hours. A CT scan demonstrated distended small bowel loops with signs of ischemia. Explorative laparoscopy showed an incarcerated internal hernia under an omental adhesive band with an ischemic dark red bowel loop. The adhesion was transected and the bowel released from the obstruction. Twenty-five mg of ICG was injected intra-venously, fluorescence uniformly diffused in the arteries of the mesentery and throughout the discoloured small bowel loop wall suggesting a reversible ischemia and an adequate perfusion. Bowel resection was so avoided and the patient rapidly recovered with no signs of late stenosis at follow-up.

Conclusion: ICG fluorescence imaging during surgery for acute SBO could be a useful tool to support clinical evaluation of bowel vitality and help decide if bowel resection for ischemia is necessary or not.

Hepato-pancreatobiliary

Double ligation of portal and hepatic veins achieves liver hypertrophy comparable to ALPPS – a study in pigs

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Objective: The liver can be induced to grow in volume by rerouting of portal vein flow to a part of the liver, when portal vein ligation (PVL) is performed. This growth can be accelerated by adding a parenchymal transection between the portal vein supplied and the portal vein deprived part of the liver (“ALPPS procedure”). A previous experiment suggests that the cause of the acceleration is

an abrogation of porto-portal collaterals that siphon portal vein blood from the growing lobe. This study tests the hypothesis that the simultaneous ligation of portal vein hepatic veins (PVL + HVL) also abrogates collateral formation and thereby also accelerates hypertrophy by occluding the outflow of the portal vein deprived side.

Methods: Portal veins of the left liver side of 8 Landrace pigs were tied in a laparotomy (PVL). Simultaneous PVL + HVL was performed in 6 pigs by adding the ligation of all major hepatic veins from the left side with the help of intraoperative ultrasound and pledged transparenchymal sutures. Kinetic growth of the two models was compared after 7 days and the anatomy of the portal vein system studied using epoxy casts. Portal vein flow and portal pressure were measured and Ki-67 staining was used to evaluate the proliferative response.

Results: PVL+ and HVL was well tolerated and only led to mild venous congestion and no necrosis of the liver. The portal vein supplied sector increased by $90 \pm 22\%$ after PVL + HVL compared to $29 \pm 18\%$ after PVL ($p < 0.001$). Collaterals were markedly reduced in PVL + HVL, while Ki-67 staining was comparable. The increase in size of the portal vein supplied liver after PVL + HVL appeared comparable to a pig model of ALPPS published before.

Conclusion: PVL + HVL leads to accelerated growth of the portal vein supplied liver, presumably due to the absence of collaterals just like in ALPPS. These findings suggest that interventional double embolization of portal and hepatic veins could –like ALPPS –increase the efficiency of regenerative liver surgery.

Beilage 1311.

Comparison of liver resection versus TACE for short- and long-term outcomes in patients with intermediate stage hepatocellular carcinoma: A systematic review and meta-analysis

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Objective: According to Barcelona Clinic Liver Cancer (BCLC) staging system, transarterial chemoembolization (TACE) is recommended in patients with intermediate stage B, while liver resection (LR) is restricted to patients with early stage A. This meta-analysis aimed to analyze long-term outcomes of LR compared to TACE in patients with intermediate stage HCC.

Methods: A systematic review was conducted according to PRISMA guidelines. Only trials comparing LR with TACE in intermediate stage patients were selected. Primary outcome was overall survival (OS) and secondary outcome was treatment-related mortality. Heterogeneity of the included studies was assessed and sensitivity analyses were performed. Depending on heterogeneity, fixed-effects or random-effects models were used to analyze hazard ratios (HR).

Results: A total of 8 eligible trials were analyzed, including 2723 intermediate stage HCC patients who underwent either LR ($n=1365$) or TACE ($n=1358$). Comparison between LR and TACE determined a pooled HR for 3-years survival of 1.87 (95% CI 1.35-2.61, $p < 0.001$) and a pooled HR for 5-years OS of 1.76 (95% CI 1.34-2.33, $p < 0.001$). Overall HR for treatment-related mortality was 1.26 (95% CI 0.66-2.40, $p=0.48$).

Conclusion: In patients with preserved liver function, LR offers increased long-term survival compared to TACE in patients with intermediate BCLC-B HCC, with comparable treatment-related mortality. These results highlight the need to refine the identification of patients with BCLC-B HCC who would benefit from LR.

Radioembolization with Y90 as bridge to liver transplantation or resection for intermediate stage hepatocellular carcinoma

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Objective: To assess the safety and feasibility of radioembolization with Yttrium-90 (Y90) for the downstaging/downsizing of hepatocellular carcinoma (HCC), initially unresectable or beyond Milan criteria.

Methods: Patients undergoing exclusively Y90 followed by either orthotopic liver transplantation (OLT) or liver resection (LR) for HCC between 2012 and 2016 were included. Primary outcomes were postoperative morbidity and mortality. Secondary outcomes were overall survival (OS) and response to Y90. Response to Y90 was evaluated by radiology (mRECIST) and histology.

Results: A total of 349 HCC patients were treated with Y90 during the study period. Nine percent (n = 32) underwent either OLT (n = 22) or LR (n = 10). Major complications and mortality were reported respectively in 5 (16%) and 1 (3%) patients. Median OS was 28 months while survival rates at 1-, 3- and 5-years reached 97%, 86% and 86%, respectively. Median absolute increase of FLR/TELV was 8.9 (-2.5–13.6) at 3 months. Median size of nodules decreased from 4.2 cm to 1.3 cm (p < 0.001) after Y90, while 50% of patients had no more viable tumor. Based on mRECIST, 18 (56%) patients showed complete response. Histologically, complete necrosis was observed on 11 (34%) specimen.

Conclusion: Radioembolization with Y90 allows controlling the tumor in the treated and non-treated (naive) liver lobes with sufficient downstaging/downsizing in 9% of patients initially not amenable to curative treatment. Y90 radioembolization allows appropriate liver hypertrophy to safely perform LR with acceptable long-term survival.

Intraoperative ultrasound based navigation for laparoscopic ablation of liver tumors

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Objective: We evaluated a navigation technique for laparoscopic ablation of malignant liver lesions that relies on intraoperative ultrasound only, thus reduces additional efforts and inaccuracies by not incorporating calibration and registration processes compared to other techniques.

Methods: The target tumor was selected on an electromagnetically (EM) tracked ultrasound image and the ablation probe placed into the target using an EM tracked trocar. After the placement, a 3D ultrasound image was used for validation of the probe position and measurement of the target positioning error (TPE). Three surgeons performed 10 ablation probe placements using the navigated approach and the non-navigated (conventional) approach in a laparoscopic model. We compared the number of probe repositionings, TPE, and time for targeting.

Results: Overall, 60 targetings were performed using the navigated and the non-navigated approach (n = 30 each). In the navigated targetings no probe repositionings were needed, whereas in 17 of the 30 (59%) non-navigated targetings the probe had to be repositioned to hit the tumor. The median TPE was 4.2 mm (IQR 2.9–5.3 mm) versus 6 mm (IQR 4.7–7.5 mm) and the median time for targeting was 39 seconds (IQR 24–47 seconds) versus 76 seconds (IQR 47–121 seconds) for the navigated and non-navigated approach respectively (p < 0.01 each).

Conclusion: This tumor-targeted navigation approach was shown to be user-friendly and allowed for more accurate and efficient targeting of liver tumors in a laparoscopic model. By not requiring a registration nor a calibration process it might represent a simple and efficient alternative to registration based navigation methods.

Fluid overload increases complications following duodenopancreatectomy within an enhanced recovery program: a cohort study

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Objective: Enhanced recovery after surgery (ERAS) programs for major abdominal surgery, including duodenopancreatectomy, have been established with successful results. Goal-directed fluid therapy and fluid balance is one of the cornerstones in ERAS. The aim of the present study was to evaluate the potential influence of perioperative fluid administration on postoperative complications.

Methods: Retrospective analysis based on a prospective database, including all consecutive patients undergoing elective duodenopancreatectomy within an ERAS program in a tertiary referral center. Perioperative fluid volumes as well as postoperative morbidity and mortality were determined. The threshold of 3500 ml of fluid was used as cutoff according to the ERAS guidelines. The comprehensive complication index (CCI) was used to assess overall morbidity.

Results: Between October 2012 and June 2017, 178 consecutive patients with a mean age of 65 years underwent duodenopancreatectomy within an ERAS program. Fourteen patients refused the use of their data. The median length of stay was 17 days (interquartile range (IQR) 12–26). The median intravenous volume of fluid within the first 24 hours was 5005 ml (IQR 3963–6124). The overall 30-days complication rate was 87.2% (143 patients) and the overall 30-days mortality rate was 1.8% (3 patients). The median comprehensive complication index (CCI) was 29.6 (20.9–46.1). Patients with <3500 ml intravenous fluid administration within the first 24 hours (n = 21) had a median CCI of 20.9 (0–34.2) compared to a median CCI of 29.6 (20.9–46.5) for those with more than 3500 ml (n = 143) (p-value 0.043). The Spearman correlation between intravenous fluid administration and postoperative CCI was statistically significant (rho = 0.162, p = 0.038).

Conclusion: Increasing intravenous fluid administration within the first 24 hours of duodenopancreatectomy in an ERAS program seems to be associated with increased morbidity.

Delay of upfront pancreatoduodenectomy in patients with ductal adenocarcinoma decreases overall survival in case of complete resection

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Objective: Some studies suggested the importance of not delaying pancreatoduodenectomy when complete surgical resection of ductal adenocarcinoma (PDAC) can be achieved. The exact timing between diagnosis and surgery remains nevertheless unknown. The goal of the present study was to assess if a long time interval between diagnosis of PDAC and surgery (TI) had worse overall survival (OS) compared to an early operation after diagnosis.

Methods: All consecutive patients who underwent pancreatoduodenectomy for PDAC in our institution were retrospectively collected (2000–2015). Date of diagnosis was defined as the date of the CT-scan where a suspicious lesion of the pancreas head was observed. Survival analyses were performed using Kaplan–Meier method and Cox proportional hazards model was used to find predictive factors for OS.

Results: From 2000 to 2015, 192 consecutive patients underwent upfront pancreatoduodenectomy for PDAC without neoadjuvant treatment. Overall complication rate was 124/192 (65%) and median comprehensive complication index was 20.9 (IQR 0–33.5). Mortality rate was 10/192 (5%). Nine patients were lost to follow-up (5%). Median TI was 27 days (17–40) and the best dichotomic threshold (TI corresponding to the maximum value of Youden's index of the ROC curve for 24-month OS) was 30 days, which was subsequently used as cutoff. In the entire cohort (n = 183), median OS was similar between the group with TI <= 30 days and the group with TI > 30 days (28 vs. 24 months, p = 0.184). Recurrence rates were also similar between both groups (56% both, p = 0.991). In patients with R0 resection (n = 103), patients with TI <= 30 days had better median OS compared to the group with TI > 30 days (37 vs. 17 months, p = 0.04). Recurrence rate was 31/66 = 47% for the TI <= 30 days group and 22/37 = 60% for the TI > 30 days group (p = 0.224). On multivariate Cox regressions of preoperative factors predictive of OS, TI > 30 days was the only factor significantly associated with shorter OS (HR 1.8, p = 0.033) in the R0 subgroup.

Conclusion: In this cohort, delaying surgery more than 30 days after initial diagnostic CT-scan was associated with poorer OS when complete resection (R0) was achieved. When upfront resection is decided, pancreatoduodenectomy should be performed within 30 days after initial CT-scan.

Impact of histological tumor positive resection after pancreatoduodenectomy in patients with ductal adenocarcinoma and lymph node invasion

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Objective: In patients with pancreatic ductal adenocarcinoma (PDAC), complete tumor resection (R0) has been proven to improve overall survival (OS). It is nevertheless unclear if, in patients with lymph node invasion, R0 resection necessitating sometimes vascular or extended resection, leads to better oncologic outcomes compared to histological tumor positive (R1) resection. The present study aimed to compare OS after R0 and R1 resections among patients with PDAC and lymph node invasion who underwent pancreatoduodenectomy.

Methods: A retrospective study of our prospectively-maintained pancreatotomy database was performed. All consecutive patients with PDAC of the pancreatic head who underwent pancreatoduodenectomy from 2000 to 2015 were analyzed. Only patients without neoadjuvant treatment were included. R0 resection was defined as the absence of microscopic cancer cells at resection margin (1 mm clearance requirement). OS was calculated using Kaplan–Meier method.

Results: A total of 192 consecutive patients underwent upfront pancreatoduodenectomy during the study period. On histopathology, 165 patients had lymph node invasion (86%), while 27 had no lymph node invasion (14%). Among patients with lymph node invasion, 92 had R0 resection (56%), 61 R1 resection (37%), and 12 R2 resection (7%). The 12 R2 resections were excluded (median OS 14 months). Preoperative characteristics and demographics of the R0 and R1 groups were similar. Overall complication rates (Clavien II–V) were also similar in both groups (53/92 = 58% vs. 41/61 = 67%, $p=0.232$). Median OS was 24 months for the R0 and R1 groups ($p=0.725$). Recurrence rate was 59% for the R0 group and 64% for the R1 group ($p=0.533$). Multivariate Cox proportional hazards model did not identify the R status or any other item as predictive factor for OS in patients with lymph node invasion.

Conclusion: In PDAC patients who underwent upfront pancreatoduodenectomy without neoadjuvant treatment, the R status did not influence the survival in case of lymph node invasion.

Bazedoxifene as a novel strategy for treatment of pancreatic adenocarcinoma through the inhibition of IL6/GP130 signaling

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Objective: Experimental studies have shown that the IL6/GP130/STAT3 pathway is involved in pancreatic cancer tumorigenesis and progression as well as in the development of various other tumors. Bazedoxifene, a selective estrogen receptor modulator clinically available for the treatment of osteoporosis, has been shown to be an effective GP130/STAT3 signaling inhibitor by in vitro and small animal studies. Our aim was to investigate the effect of bazedoxifene on tumor progression in patients with advanced pancreatic and gastric tumors.

Methods: We analyzed the data of 7 patients (5 patients suffering from pancreatic and 2 from gastric adenocarcinoma), with locally advanced and/or metastatic disease, median age 73 years old (range 48 – 86 years). Bazedoxifene was given orally at a dose of 40 mg per day for a median duration of 5 months (range 2 – 11 months). Two patients received bazedoxifene as monotherapy, 5 patients were under concomitant chemotherapy (Gemcitabine and Nab-Paclitaxel weekly).

Results: Results showed tumor marker reduction in 6 patients, stable disease on CT in 2 patients and metabolic regression on PET–CT in 2 patients (including 1, 0, 1 patients with monotherapy, respectively). One patient showed complete remission after radiotherapy and 11 months of bazedoxifene monotherapy. Weight was gained in 3 patients over 6 months follow-up. Two patients developed deep vein thrombosis on the legs and one pulmonary embolism responding well to anticoagulants. One patient presented repeated vomiting and gastro-paresis, motivating temporary discontinuation of bazedoxifene, otherwise the treatment was well tolerated (even under radiotherapy), easily available and at low cost.

Conclusion: Our preliminary data indicate that bazedoxifene is a potential new therapeutic option for pancreatic and gastric cancer therapy, through inhibition of GP130 signaling. It is already clinically available, is safe to use and at low cost. It might be administrated at an early stage with current strategies and based on these preliminary results, we will initiate a prospective clinical study.

Feasibility of enhanced recovery protocol for duodenopancreatectomy: a multicentric cohort study

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Objective: Specific enhanced recovery after surgery (ERAS) guidelines for duodenopancreatectomy (Whipple) were published, mostly by extrapolating data from colorectal surgery. This study aimed to assess the feasibility of an ERAS protocol by determining the compliance after Whipple procedure according to the validated ERAS Society guidelines.

Methods: Retrospective analysis based on a prospective database, including all consecutive patients undergoing elective duodenopancreatectomy within an ERAS program in four tertiary referral centers (Switzerland, United States, France, and Germany). Postoperative outcome (length of stay, postoperative complication according to Clavien classification) and compliance to the ERAS protocol (defined as the number of fulfilled element divided by the total number of recommended ERAS items) were analyzed.

Results: Between October 2012 and June 2017, 404 consecutive patients with a mean age of 65 years (standard deviation +/- 12) underwent duodenopancreatectomy. Median length of stay was 14 days (interquartile range 9–22). There were 46 readmissions (11.8%). The 30 days overall complication rate was 83.3% ($n=325$) with 46.2% ($n=180$) minor (Clavien grade I–II) and 37.2% major (Clavien grade III–IV) complications. The 30 days mortality was 3.1% ($n=12$). The pancreatic fistula rate was 30.5% ($n=119$) and the delayed gastric emptying rate was 33.3% ($n=130$). Mean overall compliance was 63.6% (Standard deviation (SD) +/- 9.5), with pre-, intra- and post-operative compliance of 92.9% (SD +/- 10.1), 80.8% (SD +/- 18.9), and 40.7% (SD +/- 15.3) respectively.

Conclusion: Enhanced recovery after surgery protocol according to published ERAS guidelines can safely be performed with favorable outcome. A high compliance to the protocol was observed in the preoperative and intraoperative period.

Influence of extracellular nucleotides on hepatic inflammation in a microfluidically perfused liver-on-chip model

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Objective: The liver acts as an innate immunity-dominant organ, therefore macrophages and natural killer (NK) cells provide the first line of defense against pathogens and infections. Purinergic receptors are highly expressed on immune cells which are activated by extracellular nucleotides. The aim of this study was to analyse the influence of purinergic signaling on hepatic inflammation after TLR-receptor stimulation within a liver-on-chip model and immune cells monocultures.

Methods: In an established microfluidically supported liver-on-chip model, comprising human cells including endothelial cells, macrophages, hepatocytes (HepaRG) and stellate cells (LX2), isolated NK cells from human blood were inserted. The influence of TLR receptor activation (LPS and Pam3csk4) and treatment with a non-hydrolysable ATP analog (ATPyS) was analysed in a liver-on-chip model, and in vitro monocultures of macrophages and NK cells.

Results: TLR stimulation led to a significant increase of ASAT, LDH and lactate, whereas the administration of ATPyS reduced these levels in the liver-on-chip model. Cytokines analysed in the liver-on-chip model, NK cell and macrophage monocultures revealed a significant increase of pro-inflammatory cytokines after TLR stimulation and a significant decrease after ATPyS administration after 16 and 24 hours respectively. Furthermore, treatment with ATPyS after TLR stimulation led to recovery of endothelial cell integrity (VE-Cadherin), improvement of hepatic cell function (Apo-B) and increased formation of bile canaliculi (MRP-2) assessed by immunofluorescence microscopy. TLR administration changed macrophage polarization

towards M1, whereas ATPyS stimulation led to M2 polarization. Furthermore GAPDH, PTEN and ICAM-1 expression was increased after TLR stimulation, but ATPyS led to a decreased expression.

Conclusion: ATPyS treatment of TLR-stimulated liver-on-chip model was protective regarding liver injury and cytokine release. The stimulation of purinergic receptors was associated with a functional shift of immune cells including cytokine secretion, surface and polarization markers and change of the metabolic state. The exact mechanism of these changes within the liver-on-chip model and monocultures need to be further investigated.

Importance of tight junction regulation for liver and disease

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Objective: Failure to regenerate after surgical resection is a major cause of death in advanced liver diseases. To improve the clinical outcome after intervention, it is crucial to first understand the basic mechanisms that initiate and regulate liver regeneration. Within this project, we studied tight junction proteins as potential triggers of regeneration following partial hepatectomy (PH).

Methods: Tight junction gene expression was evaluated by RNAseq and RT-PCR data and within GEO databases. Liver regeneration was induced using a mouse 70% PH model. Hepatic proliferation was quantified by pHH3 and Ki67 staining in regenerating livers of C57BL/6 mice and CLDN3^{-/-} or IL-22^{-/-} mice. Isolated human hepatocytes were stimulated with recombinant IL-22 protein.

Results: Murine and human liver express a distinct set of tight junctions, in particular mRNA of Cldn1, Cldn3, Cldn12, Tjp1, Tjp2, Jam-a, Ocln and Tric. In mice 6 hours after PH, we observed a significant down regulation of Cldn1, Cldn3, Tjp, Ocln mRNA followed by a restoration or up regulation by 24 hours. CLDN3 protein levels coincided with its observed mRNA expression. Immunofluorescent microscopy revealed a hepatic nuclear accumulation of CLDN3 48 hours post partial hepatectomy. CLDN3^{-/-} mice had significantly decreased hepatocyte proliferation and decreased cell cycle gene expression when compared to CLDN3^{+/+} control mice. IL-22^{-/-} mice showed lower expression of Cldn1, Cldn3, Cldn12, Tjp1, Ocln and Jam-A levels at 24 h and 48 h after partial hepatectomy.

Conclusion: Tight junction gene expression is regulated during liver regeneration. CLDN3^{-/-} mice had decreased hepatocyte proliferation, indicating importance of tight junctions for normal liver regeneration. Mice lacking IL-22 had inhibited tight junction up regulation after partial hepatectomy, suggesting an involvement of cytokines for tight junction regulation in the liver.

Lower gastrointestinal tract

Bascom cleft-lift procedure for pilonidal disease – instructional video presentation

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Objective: The pilonidal sinus is a frequent disease (26/100'000) mostly seen in young males. The disease is associated with a high rate of wound healing problems and recurrences after surgical management. Some patients are faced with long periods of incapacity to work. Up to now, no gold standard for an effective surgical treatment of this disease exists. According to the existing literature, resection of the pilonidal disease with off-midline closure is superior to a radical excision without closure or resection with midline closure. However, also for the resection with off-midline closure several surgical techniques are in use.

Methods: We present our algorithm to treat acute or chronic pilonidal disease. Treatment options include incision of abscess, pit picking and Bascom's procedure (cleft lift). Technical aspects of Bascom's procedure including tips and tricks will be shown in this presentation.

Results: Outcome of our own case series with Bascom's procedure including operation time, hospital stay, delayed wound healing, inability to work and recurrence rate will be provided.

Conclusion: The Bascom cleft-lift procedure allows successful treatment of advanced stage and chronic pilonidal sinus disease with primary wound closure. The limited resection of the Bascom procedure and primary wound closure tends to have shorter periods of incapacity to work and better cosmetic result compared to other transposition flap procedures.

Systematic proctological screening of HIV-positive MSM reveals incidental anal pathologies in 44% of cases

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Objective: HIV-positive men having sex with men (MSM) have an increased risk for anal dysplasia and anal cancer, pathologies associated with HPV infection. However, there is no systematic screening as compared to the well-established cervix dysplasia screening in women. This study evaluates proctologic findings in HIV-positive MSM without anal complaints.

Methods: All HIV-positive MSM followed by the infectious disease clinic are offered proctological evaluation, including high-resolution anoscopy.

Results: From January 2016 to December 2017, 75 HIV-positive MSM were referred. 33 men (44%) showed incidental and previously undiagnosed findings: condylomata acuminata (15), low-grade AIN (6), high-grade AIN (9) and anal carcinoma (2). Treatment included excision, CO₂-laserablation and cryotherapy for condylomata, excision and additional cryotherapy for AIN and radiochemotherapy for anal carcinoma.

The median year of HIV diagnosis was similar in men with (2007, range 1986–2017) and without incidental findings (2006, range 1989–2017). Men with incidental findings showed more additional related diagnoses in their history such as syphilis, hepatitis, lymphoma, condylomata and rectal ulcers (44% vs 10%).

The rate of stable partnerships was similar in men with incidental findings compared with men without incidental findings (39% vs 38%), Sexual activity was higher in men with incidental findings (61%) than in men without incidental findings (48%).

Conclusion: Almost half of HIV-positive MSM without anal complaints present with incidental anal pathologies, a third (33%) of them as serious as high-grade AIN and anal carcinoma. These results strongly support a screening program for this group of patients at risk.

Prevalence of colorectal cancer and polyps in diverticulitis patients: a systematic review and meta-analysis

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Objective: Colonoscopy is recommended after an episode of diverticulitis to exclude colorectal cancer. Recent studies question that recommendation considering the low prevalence of colorectal cancer in diverticulitis patients, notably those with uncomplicated diverticulitis, which approaches the annual incidence of colorectal cancer in the general population (0.04%). The aim of the present study was to determine the prevalence of colorectal cancer in diverticulitis patients from a systematic review.

Methods: Studies reporting the prevalence of colorectal cancer in patients with diverticulitis were searched on Medline database until 02.11.2017. Prevalences were combined using models with random effects. Subgroups comparisons were conducted using Q-test. A pooled risk ratio was assessed measure the

association between adenocarcinoma and complicated/uncomplicated diverticulitis.

Results: Thirty-one out of 448 screened studies were included, accounting for 50'445 patients. The pooled prevalence of colorectal adenocarcinoma was 1.9% (95% CI: 1.5-2.3%, I₂: 57%). Prevalence was similar between studies based on cancer registries and those based on endoscopic evaluation ($p=0.48$). The prevalence of adenocarcinoma was higher in patients with complicated diverticulitis (46 cancers for 641 patients, prevalence: 7.9%, 95% CI: 3.9-15.3%, I₂: 77%) than in patients with uncomplicated diverticulitis (42 cancers for 3834 patients, prevalence: 1.3%, 95% CI: 0.08-2%, I₂: 40%) with a pooled risk ratio of 5.59 (95%CI: 2.61-28.28, I₂: 72%). Among patients who underwent endoscopy, the pooled prevalences of polyps, adenomas and hyperplastic polyps were 23% (95%CI: 20-26%, I₂: 85%), 14% (95%CI: 12-17%, I₂: 80%) and 9% (95%CI: 8-11%, I₂: 59%), respectively.

Conclusion: In diverticulitis patients, the pooled prevalence of colorectal adenocarcinoma was 1.9%. This prevalence was higher in patients with complicated diverticulitis (prevalence of 7.9%) than in patients with uncomplicated diverticulitis (prevalence of 1.3%) with a pooled risk ratio of 5.59. The prevalence of adenocarcinoma remained, however, clinically significant in all sub-populations. Therefore, colonoscopy after an episode diverticulitis should be recommended.

Respiratory complications after colorectal surgery - avoidable or fate?

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Objective: The prevention of postoperative pulmonary complications (PPC) is targeted by several enhanced recovery (ERAS) items including early mobilisation, prevention of fluid overload and omission of routine nasogastric tubes. The aim of the present study was to assess the impact of ERAS on PPC.

Methods: Retrospective analysis of an institutional prospective database including consecutive colorectal ERAS procedures from May 2011 until May 2017. Multiple logistic regression was performed to identify risk factors for PPC among demographic, surgical characteristics and items related to the ERAS protocol.

Results: In total, 1298 patients were included, among them 120 (9.2%) had one or more PPC. Multivariable analysis retained minimally invasive surgery (Odds Ratio (OR) 0.26; 95% Confidence Interval (CI) 0.15-0.46) and compliance to the ERAS protocol of $\geq 70\%$ (OR 0.53; CI 0.30-0.94) as protective factors. Emergency surgery (OR 2.70; CI 1.20-6.01), blood loss of ≥ 200 mL (OR 2.06; CI 1.20-3.53) and ASA score of ≥ 3 (OR 2.00; CI 1.12-3.57) were independent risk factors. Median length of hospital stay was significantly longer in patients who experienced respiratory complications (21 [4-183] vs. 6 [1-95] days, $p < 0.001$).

Conclusion: Minimally invasive surgery and high compliance with the ERAS protocol can help to prevent PPC.

Beilage 1283.

Coffee accelerates recovery of bowel function after elective colorectal resection – a randomized controlled trial

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Objective: To test the effect of standardized coffee intake on postoperative bowel movement after elective colorectal resection.

Methods: Between 9/2014 and 12/2016 patients scheduled for elective colorectal surgery were randomized to receive either coffee (intervention group) or tea (control group). 150 ml of the respective beverage was drunk 3x/d every postoperative day until discharge.

The primary endpoint was time to first bowel movement. Secondary endpoints included second bowel movement, use of laxative, insertion of nasogastric tube, length of hospital stay and postoperative complications.

Results: A total of 115 patients were randomized: 56 were allocated to the coffee and 59 to the tea group. After coffee intake, the first bowel movement occurred after a median of 65,2 h (95% CI: 50.5-79.8) as compared to 74.1 h (95% CI: 60.7-87.5) in the control group (intention-to-treat-analysis; $P=0.008$). The hazard for earlier first bowel movement after coffee intake was 1.67 (95% CI: 1.14-2.44; $P=0.009$). Furthermore, 7.1% of the patients in the coffee group experienced the first bowel movement within 24 h after surgery as compared to 1.7% in tea group.

Conclusion: Coffee intake after elective colorectal resection leads to a faster recovery of bowel function. Therefore, coffee intake represents a simple and effective strategy to prevent postoperative ileus.

Quality of life and functional outcomes after coloanal side-to-end anastomosis for rectal cancer

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Objective: Low anterior resection (LAR) for rectal cancer with coloanal anastomosis (CAA) may lead to diverse functional outcomes, influencing the quality of life (QoL) after surgery. Several reconstruction methods, including side-to-end CAA, straight CAA, colonic-J-pouch and transverse coloplasty have been introduced. The aim of this study is to evaluate the side-to-end CAA in terms of function and QoL.

Methods: A total of 173 patients who underwent LAR with side-to-end CAA between 2003 and 2016 in a single institution were included in this study. Quality of life was evaluated using the Gastrointestinal Quality Of Life Index (GIQLI) questionnaire. Functional outcomes in terms of fecal continence were measured using the Wexner incontinence score.

Results: Patients' mean age at the time of operation was 66.2 years. The mean (SD) Wexner score was 7,64 (4.1). This score corresponds to a mild incontinence level. A score of 9 or higher has been associated with a negative impact on quality of life. The mean (SD) GIQLI score was 109.91 (18.3), while the mean (SD) score for healthy individuals is estimated to be 125.8 (13.0).

Conclusion: Side-to-end CAA offers satisfactory results in terms of fecal continence and QoL. CAA should be offered as an option for patients with low rectal cancer.

LARS is associated with lower anastomoses, but not with the transanal approach in patients undergoing rectal cancer resection

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Objective: Low Anterior Resection Syndrome (LARS) is a frequent defecatory disorder in patients after Low Anterior Resection (LAR) with Total Mesorectal Excision (TME). Over the past years, transanal (ta) TME evolved as a promising technique for low rectal pathologies to overcome the difficulties encountered with the abdominal approach in a narrow pelvis. However, the impact of the transanal approach on functional outcomes has not been sufficiently investigated yet. This study evaluates LARS scores in our cohort of patients after taTME compared to a historic group that underwent LAR using the abdominal approach.

Methods: A total of 41 patients (n=21 taTME, n=20 abdominal approach) with low and mid rectal adenocarcinoma were included. LARS scores are routinely recorded in our outpatient clinic after LAR/TME. LARS scores of the historic group with abdominal approach were collected by chart review and telephone interviews. LARS scores 6 month after reversal of the protective ileostomy were analyzed for this study.

Results: Overall, 19.5% of patients presented without LARS symptoms at the 6-month follow-up. 43.9% presented with minor and 36.6% with major LARS. No significant association of the T-stage, N-stage and neo-adjuvant radiotherapy and LARS scores was found. Also, LARS scores in patients with colo-anal hand-sewn compared to stapled anastomosis were not significantly different (30.6 ± 8.9 vs. 25.9 ± 7.5 , $p=0.161$). The mean distance of the anastomosis from the anal verge was 3.9 ± 2.0 cm. The anastomosis was significantly lower in the taTME group compared to the control group (3.0 ± 1.6 vs. 4.6 ± 2.0 cm,

$p=0.007$). LARS scores were significantly higher in patients with an anastomosis ≤ 4 cm from the anal verge compared to patients with an anastomosis >4 cm (30.0 ± 7.6 vs. 20.0 ± 8.1 , $p=0.001$). However, LARS scores in the taTME group compared to the control group did not show a statistical difference (29.5 ± 9.6 vs. 24.9 ± 7.9 , $p=0.104$).

Conclusion: Overall, the majority of patients in this small cohort presented with some degree of LARS symptoms after LAR. As previously described, LARS scores significantly increased with an anastomosis 4 cm from the anal verge or below. Although anastomoses were lower in the taTME compared to the control group, taTME was not significantly associated with LARS 6 month after closure of the protective ileostomy.

Rectal cancer surgery with TME after neoadjuvant chemoradiotherapy without initial stoma placement

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Objective: The primary placement of a protective ileostomy or transversestomy is commonly used in rectal cancer surgery with TME. Nevertheless there is a patient collective, where the initial stoma placement can be omitted during the procedure. We analyzed our perioperative results in patients with locally advanced rectal cancer and neoadjuvant chemoradiotherapy (CRT), who got an open, laparoscopic or robotic assisted surgery without primary stoma placement.

Methods: Retrospective analysis of prospectively collected data. From March 2005 to September 2017 a total of 358 patients with rectal cancer underwent an open, laparoscopic or a robotic-assisted DaVinci Xi TME in our department. Forty-six of them (12.8%) without primary stoma placement.

Results: Mean BMI was 24.9 ± 4.7 kg/m², mean age was 61.8 ± 12.1 years, mean tumor distance from anocutaneous line was 9.2 ± 2.5 cm. Severe complications (Clavien-Dindo III or IV) occurred in 7 patients (15.2%), 3 of them had an anastomotic leakage (6.5%). The patients with anastomotic leakage were reoperated by secondary stoma placement. We saw no case in which the anastomosis had to be resected. The technique of the surgical approach (e.g. open, laparoscopic, robotic assisted) showed no effect on the perioperative outcome ($p=0.48$). The mean hospital stay was 15.2 ± 6.3 days.

Conclusion: Rectal cancer surgery without primary stoma placement is feasible and can be considered in suitable patients. Nevertheless close-knit postoperative surveillance is crucial to detect anastomotic problems early. In these situations secondary stoma placement can be done with good outcome.

Transanal TME – the key to better rectal cancer surgery? Overview after 355 rectal cancer resections 2013 – 2017

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Objective: Transanal approach is coming up as the new option for rectal cancer surgery. It seems to enable better mesorectal quality, margins and lower conversion rates.

Methods: We present our series of rectal cancer resections from 2013 to 2017 looking on open, laparoscopic (incl. Single port), robotic and transanal resections.

Results: From 2013 to 2017 a total of 355 rectal cancer resections were performed, m/f was 226(64%)/129(36%), median BMI was 25,8 (14,1 – 47,9), age 67 (20 – 94). 205 patients (58%) received neoadjuvant RCT. 243 (68%) received TME, 16 % PME, and 16 % abdominoperineal resection. Approach was Laparoscopy in 154, transanal in 124 (120 TME, 4 APR), robotic in 17 and open in 60 patients. Conversion rate was 5,6% overall, 10% in laparoscopy, 3% in transanal (all abdominal) and 6% in robotic approach. Median operation times was 261 min. Mesorectal quality showed overall Quirke score 1 in 87% resp. 3 in 4%, in laparoscopic approach this was 82% and 7% resp., in open 76% and 5%, in robotic 94% and 0% and transanal approach 95% and 0%. Over five years primary open resections dropped from 30% to 7%, while overall conversion rate dropped from 10% to 0 - 4% per year.

Conclusion: Transanal approach to rectal cancer resections achieved lower primary open resections, lowest conversion rate and best mesorectal quality. For the moment it is the best approach we are able to offer, only few cases will stay open or have to be converted.

Influence of the introduction of caseload requirements on indication for surgery – a population based analysis for rectal cancer surgery in Switzerland

Abstract Withdrawn.

[Correction added on 16 May 2018, after first online publication: The abstract “Influence of the introduction of caseload requirements on indication for surgery – a population based analysis for rectal cancer surgery in Switzerland” has been withdrawn in this current version.]

Preoperative clinical score predicting outpatient management after laparoscopic appendectomy

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Objective: Outpatient laparoscopic resection for acute appendicitis is feasible in selected patients. The aim of the present study was to assess preoperative (clinical and biological) factors associated with outpatient appendectomy (OA), defined as hospital discharge within 24 postoperative hours and to create a preoperative score predicting OA.

Methods: All consecutive laparoscopic appendectomies performed in our institution between January 1st 2013 and May 31st 2015 were retrospectively analyzed. Patients <16 years and elective operations were excluded. Preoperative factors (demographic, clinical and biological), without imaging, were compared between patients with OA and longer stay. Preoperative factors associated with OA were identified. Based on the adjusted Odds Ratio (OR) of these significant

factors, a scoring system was created, whereby a higher score was associated with higher probability for OA.

Results: A total of 578 patients with emergency laparoscopic appendectomy were included. Among them, 303 (53%) were discharged within 24 h after surgery. On a multivariable level, male gender ($p=0.01$, OR 1.61), ASA class I-II ($p=0.037$, OR 9.52), absence of generalized guarding ($p=0.019$, OR 3.55), preoperative C-reactive protein (CRP) <100 mg/dl ($p<0.0001$, OR 3.09) and white blood cell count <20 G/L ($p=0.046$, OR 2.06) were significantly associated with OA. Based on these parameters, the scoring system was created, with a range of values between 0 and 21; a score ≥ 17 was defined as the optimal threshold, with a sensitivity of 95.6% and a negative predictive value of 82.2%.

Conclusion: Male patients with low-risk ASA-class, reassuring clinical exam, low CRP and white blood cell values are optimal candidates for OA. Adult patients eligible for OA may be identified with high accuracy based on this new clinical preoperative score without imaging.

Presentations and aetiologies of acute colitis: a prospective cohort study

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Objective: The aims of the present study were to determine the aetiologies of acute colitis and to identify predicting factors for patients requiring endoscopy.

Methods: All patients admitted to the emergency department with symptomatic colitis diagnosed on computed tomography were included in the present study. Patients with ascites, history of colorectal carcinoma or inflammatory chronic bowel disease (ICBD) were excluded. Stools were analysed using routine PCR assay and FilmArray Gastrointestinal PCR Panel Kit (Biomérieux). Faecal calprotectin was measured in all patients. Patients with negative routine PCR underwent colonoscopy.

Results: From 11.2016 to 11.2017, 136 patients were eligible. Fifty-nine were excluded, leaving 77 patients for inclusion. FilmArray was positive in 45 patients (58.4%). Twenty-four of them (53.3%) were tested positive for *Campylobacter* spp, 13 (28.9%) for *E. coli* pathovars, 9 (20%) for *Clostridium difficile*, 4 (8.9%) for *Salmonella* spp, 3 (6.7%) for *Shigella* spp, 1 (2.2%) for *Plesiomonas shigelloides* and 3 (6.7%) for viruses (Norovirus, Rotavirus and Sapovirus). Thirty-six patients had negative routine PCR assay and underwent colonoscopy within 5.4 ± 2.3 days. Colonoscopy revealed ulcero-hemorrhagic colitis in 2 patients, Crohn's disease in 1 and ischemic colitis in 6. Colonoscopy was normal or showed eosinophilic infiltration of the bowel wall in 27 patients (75%). Three polyps were removed: 2 tubular adenomas and one tubulo-villous adenoma, all with low-grade dysplasia. No adenocarcinoma was found. Calprotectin values were significantly higher in patients with ICBD than in patients with infectious, ischemic or undetermined colitis ($10'050 \pm 10'313$ mg/g versus 1535 ± 3296 ,

1436 ± 1142 and 259.3 ± 1877 , respectively, $p<0.001$). A calprotectin value $>10'000$ mg/g was identified as a strong predictor of ICBD according to logistic regression (OR 67 (95% CI: 4.14-1082.28).

Conclusion: In conclusion, aetiologies of colitis were infectious in 60% of patients, ischaemic in 8% and ICBD in 4%. 28% of patients had undetermined colitis and most of them showed eosinophilic infiltration of the bowel wall on histology. No patient had cancer. Infectious colitis was mostly caused by *Campylobacter* spp (53%), *E. coli* pathovars (20%) and *Clostridium difficile* (9%). A calprotectin value $>10'000$ mg/g was identified as a strong predictor (OR 67) of ICBD.

Urgent large bowel decompression: Caecostomy is a valid alternative to loop colostomy

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Objective: The construction of a colostomy is a standard procedure for the urgent management of distal colonic obstruction. The role of caecostomy as a method for large bowel decompression has generated much controversy, often being considered only in severely ill patients. The aim of this study was to compare urgent caecostomy (UC) and urgent loop colostomy (ULC), testing the hypothesis of the non-inferiority of the UC approach.

Methods: This is a retrospective study that compares the results between UC and ULC as urgent large bowel decompression, performed by different surgeons in our institution between 01/2013 and 07/2017. The choice to perform a UC or a ULC was left to the operator but in most cases extreme caecum dilatation was the given reason to choose a UC. Demographics were similar between both groups although the number of patients with an ASA score >2 was a little higher in the UC group (33.3% vs 0%, $p=0.118$). Complication rate, duration of surgery and hospital stay, colostomy construction and reversal (when performed), were compared.

Results: A total of 24 patients were included, 15 UC and 9 ULC. The median follow up time was 8.73 months in the UC group vs 16.30 in the ULC. Duration of surgery was significantly higher in the ULC group (100.78 vs 54.93, $p=0.030$). Hospital stay was similar (20.47 vs 18.44 days). Overall, 40% of patients in the UC group presented with complications vs 33.33% of the patients in the ULC group ($p=0.547$). There was one death in each group. In each group there was one stoma prolapse and one stoma site infection. More UC's were reversed (80.0% vs 33.3%, $p=0.032$). The reversal surgery duration (56.67 min vs 78.33 min; $p=0.154$) was shorter in the UC group, with a similar hospital stay (13.5 vs 11.25 days). After stoma reversal there was one surgical-site infection in the UC group and one stenosis with fistula formation in the ULC group.

Conclusion: Despite the limitations of our retrospective study with a small number of patients, caecostomy seems to be a safe alternative for urgent decompression colostomy in large bowel obstruction. In our study UC was significantly faster than ULC, with similar complication rate and hospital stay. Further studies should be carried out to confirm these findings.