Visceral Surgery

Does liver kinetic growth rate predict postoperative liver failure after ALPPS?


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Objective: Posthepatectomy liver failure (PHLF) may occur after ALPPS (Associating Liver Partition and Portal vein ligation for Staged hepatectomy) despite a sufficient standardized future liver remnant (sFLR) volume. Kinetic growth rate (KGR), describing the percentage increase of sFLR per day, may be a valuable surrogate marker of liver regeneration.

Methods: Ninety-six patients, who underwent ALPPS (n = 38) or conventional two-stage hepatectomy (TSH) (n = 58) for various diseases at our institution were analyzed. KGR was assessed by liver volumetry. PHLF was defined according to the “50-50” and ISGLS criteria. The ability of KGR to predict postoperative liver failure after ALPPS and conventional TSH was investigated.

Results: The incidence of PHLF was 15% and 26% according to the “50-50” and ISGLS criteria, respectively. PHLF was more frequent in the ALPPS group, but the difference did not reach statistical significance (p = 0.09 for “50-50” and p = 0.17 for ISGLS criteria). Median KGR was significantly increased after ALPPS (6.9%/day, IQR 3.7-10.5) compared to the conventional group (0.7%/day, IQR 0.04-0.97, p < 0.001). KGR failed to predict PHLF in the conventional TSH group. A KGR ≥ 6%/day within 7 days after ALPPS stage 1 was associated with a significant reduced risk of PHLF (50-50)/ISGLS after ALPPS stage 2 (p = 0.03/p = 0.05). No PHLF was observed when combining a KGR ≥ 6%/day and sFLR > 30% within 7 days after surgery (p = 0.02).

Conclusion: Assessment of KGR is a novel tool to predict PHLF after ALPPS. Respecting KGR and sFLR after ALPPS stage 1 may dramatically increase safety in patients undergoing ALPPS.

ALPPS reduces the chemotherapy-free interval in patients with colorectal liver metastases

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Objective: Two-stage hepatectomies (TSH) enable extended liver resection in patients suffering from advanced bilobar colorectal liver metastases. Chemotherapy is commonly discontinued before portal vein occlusion and restarted after curative resection. Long chemotherapy-free intervals (CFI) may lead to tumor progression and poor oncological outcomes. The aim of this study was to investigate whether ALPPS (Associating Liver Partition with Portal vein ligation for Staged Hepatectomy) is associated with a shorter CFI compared to conventional TSH and whether it impacts on oncological outcomes.

Methods: Seventy-four patients suffering from bilobar colorectal liver metastases who underwent ALPPS (n = 43) or conventional TSH (n = 31) at two tertiary centers were analyzed. CFI was assessed and its impact on outcome was analyzed by uni-and multivariable analyses.

Results: Postoperative chemotherapy was administered in 58% (25/43) of ALPPS patients and in 61% (19/31) of the patients undergoing conventional TSH (p = 0.63). The use of postoperative chemotherapy was associated with significantly improved mean overall survival (OS) (36 ± 1 vs. 13 ± 1 months, p < 0.001). Overall, the median CFI from surgery to postoperative chemotherapy was 16 weeks (IQR 11–31) and was significantly shorter in the ALPPS group when compared to the conventional TSH group (10 vs. 23 weeks, p < 0.001). A CFI of ≤ 10 weeks was associated with improved mean OS (p = 0.003) and disease-free survival (DFS, p = 0.009). In multivariable analysis a CFI ≤ 10 weeks remained an independent factor associated with better OS (p = 0.006) and DFS (p = 0.010).

Conclusion: ALPPS-associated accelerated tumor resection has the potential to reduce chemotherapy-free interval when compared to TSH, which may positively influence oncological outcomes.

Decreasing leak rate using microperfusion imaging after colorectal anastomosis. Result of the European phase II study

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Objective: Since the last 30 years many attempts have been made to assess anastomotic microperfusion. The use of Near infrared (NIR) technology with the injection of Indocyanine green (ICG) seems to offer this possibility. We present the result of the European phase II multicentric study on microperfusion. The primary endpoint of this study is to evaluate a decrease of anastomotic leak rate using this technology, as well as any change of attitude due to this assessment.

Methods: Multicentric prospective study of patients undergoing colorectal resection. An ICG injection (2.5mg/ml) is performed after vessel division and anastomosis and anastomotic microvasculatisation assessed with the laparoscopic NIR system (Pinpoint or Firefly).

Results: 375 procedures have been performed between January 2014 to December 2015. Colorectal cancer is the main indication (n = 242), followed by diverticulardisease (70) and BBD, Crohn’s disease (32) and ulcerative colitis (13), 18 for other indications. There has been 142 high anterior resection and 24 Hartmann’s reversal, 69 low anterior resection, 9 J-pouch, 10 IRA, 107 right hemicolectomy, and 14 others. Laparoscopic surgery was performed in 90% (383) with a conversion rate of 6% (22). There was a short time for ICG to give a signal, with a median of 30 seconds (10–107 sec). Median added time per procedure was of 4 minutes (0.55 sec–20min). A change of attitude was necessary in 24 cases (6.4%). We recorded 9 postoperative leaks (2.4%).

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**Conclusion:** Using NIR imaging with an ICG perfusion for the assessment of the blood supply during surgery is reliable and add a marginal time to the entire procedure. This technology allows a very low leak rate (2.4%), with a change of attitude in about 6.4% of the procedures.

**Survival after resection of appendiceal carcinoma by hemicolectomy and less than hemicolectomy: a population-based, propensity score matched analysis**

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**Objective:** The treatment of appendiceal carcinoma is controversial despite the recommendation for a right hemicolectomy for a tumor size exceeding 2cm. The aim of this population-based study was to evaluate the survival after right hemicolectomy (RH) compared to less radical resections than right hemicolectomy (LRH).

**Methods:** A total of 1144 patients who underwent resection of stage I-III appendiceal carcinoma from 2004 to 2012 were included in the Surveillance, Epidemiology, and End Results database. Overall survival (OS) and cancer-specific survival (CSS) were assessed by unadjusted and risk-adjusted Cox regression analysis and by propensity score adjustment.

**Results:** A total of 855 (74.7%) patients underwent RH and 289 (25.3%) underwent LRH. In an unadjusted analysis, survival after LRH was slightly better than after RH for OS (HR = 0.95, 95%CI: 0.71–1.27, P = 0.707) and CSS (HR = 0.95, 95%CI: 0.68–1.32, P = 0.762), however without reaching statistical significance. The 5-year OS and CSS in patients who underwent RH were 71.6% (95%CI: 67.8–75.6%) and 76.4% (95%CI: 72.8–80.3%) compared to 73.8% (95%CI: 67.9–80.2%) and 78.7% (95%CI: 73.2–84.7%) in patients with LRH. No relevant difference between LRH and RH could be observed in multivariable analysis for OS (HR = 0.90, 95%CI: 0.65–1.25, P = 0.493) and CSS (HR = 0.87, 95%CI: 0.60–1.26, P = 0.420), not after propensity score matching and weighting analysis, (OS; HR = 0.87, 95%CI: 0.62–1.22, P = 0.442 and CSS: HR = 0.97, 95%CI: 0.67–1.40, P = 0.883).

**Conclusion:** Contrary to common belief, survival after RH for appendiceal carcinoma was not statistically superior to LRH. Hence, the recommendation in recent guidelines to generally perform RH in patients with appendiceal carcinoma must be revisited.

**Survival after abdominoperineal and sphincter-preserving resection in non-metastatic rectal cancer: a population-based time-trend and propensity score-matched SEER analysis**

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**Objective:** To assess the putative impact of abdominoperineal resection (APR) versus coloanal anastomosis (CAA) for non-metastatic rectal cancer on survival. Summary Background Data: It is unclear whether adverse outcome after APR is due to the surgical procedure itself or is a consequence of tumor-related characteristics.

**Methods:** Patients were identified from the Surveillance, Epidemiology, and End Results database. The impact of APR versus CAA on survival was assessed by Cox regression and propensity-score matching. Joint regression was applied for time-trend analysis.

**Results:** In 56,488 patients with rectal cancer resection, the APR rate declined from 31.8% in 1998 to 19.2% in 2011, with a significant trend change in 2004 at 21.6% (P < 0.001). The annual percent change in APR rate was −7.1% until 2004 and −2.0% thereafter. Therefore, survival analysis was limited to patients diagnosed between 2005 and 2011 to minimize a potential time-trend bias. Out of 4,700 non-metastatic rectal cancer patients, 3,898 underwent APR and 802 underwent CAA. APR was associated with an increased risk of overall and cancer-specific mortality after unadjusted analysis (HR = 1.58, 95%CI:1.31–1.91 and HR = 1.61, 95%CI:1.28–2.01, P < 0.01) and multivariable adjustment (HR = 1.37, 95%CI:1.13–1.67 and HR = 1.39, 95%CI:1.10–1.76, P < 0.01). After optimal adjustment of highly biased patient characteristics by propensity-score matching, APR was not identified as a risk factor for overall and cancer-specific mortality (HR = 0.99, 95%CI:0.70–1.40, P = 0.968 and HR = 0.85, 95%CI:0.56–1.29, P = 0.456).

**Conclusion:** The current propensity score-adjusted analysis provides compelling evidence that worse oncological outcomes in patients undergoing APR compared to CAA are caused by different patient characteristics and not by the surgical procedure itself.

**A novel machine learning algorithm to guide patient selection for liver transplantation**

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**Objective:** A candidate for liver transplantation (LT) will go through 2 processes to be selected to receive an organ. Firstly the patient is evaluated for suitability to be listed for transplant, and subsequently is prioritized among all other candidates when an organ becomes available. The second step is a competitive process, which is well regulated by the MELD score showing a good discriminative capability. However, no model exists that efficiently predicts post-LT long term survival. In opposite to the prioritizing process, assessment of post-LT survival needs a calibrated model. We created a new mathematical model to predict individual survivals that we applied to patients transplanted for Primary Sclerosing Cholangitis (PSC).

**Methods:** We included all adult patients from the Scientific Registry of Transplant Recipients transplanted for PSC between 1995 and 2013. We selected variables by multivariate Cox regression that we entered in a learning machine that we previously developed, PSSP (Patient-Specific Survival Prediction). PSSP permits building models that generate individual probabilistic survival curves based on individual variables. Models were assessed by 5x cross validation. We created a new calibration allowing assessing multiple survival curves, called distribution (d-) calibration. Single point calibration was assessed by Hosmer-Lemeshow test. p < 0.05 suggests poor calibration.

**Results:** 4395 patients were included, of whom 378 had a second LT. Eight variables were retained by Cox regression for the first LT including 3 donors’ variables. A similar predictive model can be generated without donors’ factors, for use during listing evaluations. Models showed excellent d-calibration (p = 1.0 and 0.97 for model with and without donor information respectively), a 5-year HL p-value of 0.08 and 0.1 (with and without donor information respectively). A calculator is available at: http://pssp.srv.ulberta.ca/calculator/liver_transplant. Similar models were also developed to predict survival after a 2nd liver transplant for PSC, showing also a good d-calibration (p = 0.95 and 0.94) and single-point calibration (5-years HL p-values 0.3 and 0.12, with and without donor information respectively).

**Conclusion:** We propose a new tool to assess individual survivals and a novel method to validate it, which allowed developing an accurate model to predict survival after LT for PSC.

**Recurrent laryngeal nerve injury after thyroid and parathyroid surgery: evaluation of treatment outcomes**

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Objective: Recurrent laryngeal nerve (RLN) injury is one of the most feared complications after thyroid or parathyroid surgery. It represents a disturbing postoperative problem for the patient. The aim of the present study was to assess the incidence of transient/permanent postoperative RLN injury after thyroid or parathyroid surgery and to observe the timing of recovery.

Methods: All consecutive patients operated for thyroid or parathyroid pathologies in our department from 2005 to 2013 were retrospectively reviewed for vocal cord paresis. All patients benefited from a fibroscopic laryngeal exam preoperatively and on postoperative day 1. Patients’ data were collected in a database for statistical analysis. Transient and permanent postoperative RLN injuries were analyzed. Treatment types were assessed, and recovery times were collected.

Results: The cohort included 653 patients (456 thyroid and 197 parathyroid resections) with a total of 955 nerves at risk. There were 76 immediate postoperative vocal cord paresis observed (76/955, 8%). Among the 76 diagnosed paresis, 69 were transient (69/955, 7%) and 7 permanent (lasting more than one year, 7/955, 1%). The main treatment was speech therapy in 51% (39/76) of patients. Thirty-two patients had no particular treatment, 4 patients had an interventional treatment (3 cord medializations, 1 partial arytenoidectomy), and 1 benefited from physiotherapy. The median recovery time of transient injuries was 8 weeks. Risk factors for permanent injuries were previous thyroidectomy, intraoperative RLN injury, and complete immobility of the vocal cord postoperatively.

Conclusion: RLN injuries after thyroid or parathyroid operations have a good prognosis. Most of the patients with transient postoperative RLN injury will recover normal vocal cord mobility within 6 months after the operation. Permanent RLN injuries remain rare (7 out of 955 nerves at risk).

Impact of preoperative chemotherapy on liver volume before and after right hemi-hepatectomy for colorectal metastases. Case series of 70 patients

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Objective: Factors associated with liver regeneration after major hepatectomy are unknown.

Methods: Seventy patients undergoing right hemi-hepatectomy or extended right hemi-hepatectomy for colorectal liver metastases between January 2005 and December 2014 in a tertiary care hospital in Switzerland (n = 31) and in Japan (n = 39) were included in the analysis.

Total liver volume (TLV) and remnant liver volume (RLV) were measured before and 6 months (mean) after surgery. Relative liver regeneration (regeneration index) was defined as: [remnant liver volume in 6 months (RLV6M)−RLV]/RLV×100(%). We also used a recently reported standard liver volume (SLV) to take into account of difference between Asian and Caucasian populations. (Kokudo T et al. J Hepatol in press)

Results: The remnant liver increased by +64.5% (median RI, range: −4.9-111) 6 months after right hepatectomy and RLV6M was 75.5% (median, range: 43.8-113) of the initial TLV. Factors significantly affecting RLV6M/TLV were country (Switzerland vs. Japan, median 81.3% and 72%), chemotherapy before surgery (Yes vs. No, median 78.3% and 65.4%), and operating time (>360 min vs. ≤360 min, median 73.4% and 80.5%). Factors significantly affecting RI were country (Switzerland vs. Japan, median 94.8% and 46.7%), body mass index (>25 vs. ≤25, median 96% and 55%), and in chemother- apy before surgery (Yes vs. No, median 71.3% and 44.2%). Actual TLV against SLV ratio was significantly smaller in preoperative chemotherapy group (median 95.8% vs. 102.5%, p = 0.03). However, RLV6M against SLV ratio were not different. There are no significant difference in maximum total bilirubin and minimum prothrombin time during three months after hepatectomy.

Conclusion: Chemotherapy before surgery does not seem to impair liver regeneration and liver function. Furthermore, longer surgery (over 360 minutes) may impair liver regeneration in volume.

Reversibility of chemotherapy-related liver injuries

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Objective: To analyze the reversibility of chemotherapy-related liver injuries (CALI) in patients undergoing liver resection (LR) for colorectal liver metastases (CRLM).

Methods: All LR performed for CRLM between 2000 and 2012 after oxaliplatin and/or irinotecan-based chemotherapy were included. All specimens were reviewed to evaluate CALI, i.e. grade 2–3 sinusoidal dilatation (G2-3SinDil), nodular regenerative hyperplasia (NRH), steatosis, and steatohepatitis. Two different analyses were performed. First, LRs were stratified according to the time between the end of the last chemotherapy cycle and hepatectomy (Time_CTx-Surg). ROC curves were plotted to identify a cut-off point in the chemotherapy-surgery interval with regard to the presence of CALI. Second, patients receiving repeat LRs without interval chemotherapy were considered. The CALI occurrence into the two specimen of the same patient were analyzed and compared.

Results: Overall, 524 LRs performed in 429 patients were analyzed. The median Time_CTx-Surg was 56 days (15–1264). Time_CTx-Surg exceeded 180 days in 53 patients and 270 days in 31 (chemotherapy for previous LR or adjuvant treatment after colorectal surgery). The incidence of CALI was not significantly different among groups who underwent surgery after intervals <270 days. Patients with an interval >270 days had lower prevalence of G2-3SinDil (19.4% vs. 40.0%, p = 0.022) and NRH (6.5% vs. 20.1%, p = n.s.). Prevalence of steatosis and steatohepatitis remained stable. On multivariate analysis, a Time_CTx-Surg >270 days was an independent protective factor for G2-3SinDil (p = 0.009).

Conclusion: CALI persists for a long time after chemotherapy. Only after nine months without chemotherapy, sinusoidal dilatation and NRH significantly regress, while steatosis and steatohepatitis persist. The pathology data of the first LR and the overall interval after the end of chemotherapy should be accurately considered to assess the operative risk of a new hepatectomy and to schedule potential new chemotherapy lines.

Mesorectal quality and circumferential radial margins in rectal cancer resections looking on different approaches: open, laparoscopic, robotic and transanal – what is best?

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Objective: Mesorectal quality after rectal cancer resection is one of the most important parameters for quality of surgical technique, but also beside tumour stage and circumferential radial margin for patients survival. Especially in male and obese patients good mesorectal quality and CRM is difficult to achieve. Looking on the recent literature transanal approach to TME seems to be less time consuming giving better postoperative results. Moreover, mesorectal quality and CRM could be better.

Methods: We present our series of rectal cancer resections from 2013 to 2015 comparing mesorectal quality and CRM of open, laparoscopic (incl. single port), robotic and transanal resections.
Lymph node involvement is the most important prognostic factor of at least 12 resected lymph nodes is required for adequate staging. If this number is not reached, patients may be understaged and hence not benefit from a necessary adjuvant chemotherapy. For more accurate nodal staging, some groups proposed the sentinel lymph node (SLN) mapping. The aim of this study was to compare the established isosulfan blue (IB) based SLN procedure with the new near-infrared fluorescence (NIR) FLARE™ surgical imaging technique regarding their diagnostic accuracy and upstaging rates.

**Methods:** A total of 154 consecutive patients with stage I-III colon cancer undergoing standard oncologic resection were enrolled from three hospitals in Switzerland in this prospective multicenter comparative trial. In a first cohort with 104 patients, SLN mapping was performed after peritumoral injection of 1% IB. In a second cohort with 50 patients, ex-vivo injection of human serum albumin conjugated indocyanine green and detection with NIR using the FLARE™ surgical imaging technique was later introduced and performed to detect the SLN. During histopathology, three levels of each SLN were stained with hematoxylin and eosin. If negative for nodal tumor infiltration, immunostaining with cytokeratin 19 (CK19) monoclonal antibody was performed.

**Results:** The mean lymph node harvest in the IB and NIR groups was 29 (SD 12) and 23 (SD 9), respectively (p = 0.006). The SLN identification rate was 100% and 98% for IB and NIR, respectively. Accuracy and sensitivity was 86% and 69% for IB, 82% and 63% for NIR, respectively. A total of 100 (80%) patients were node negative. In these node negative patients, upstaging due to the SLN mapping was 17% (12/71) with IB and 21% (6/29) with NIR (p = 0.775).

**Conclusion:** This is the first prospective multicenter comparative study showing that SLN mapping offers an upstaging rate of up to 21% in patients with presumed node negative colon cancer. The lymph node identification rate was very high for both the new NIR and the established IB SLN mapping. Further prospective studies are needed with adequate sample size to translate these findings into a potential survival benefit.

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**Early MRI-based liver lipid quantification predicts outcome after extended hepatectomy**

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**Objective:** Small for Size Syndrome (SFSS) is defined as liver failure after extended hepatectomy due to insufficient regeneration of a too small liver remnant. We investigated early postoperative magnetic resonance imaging (MRI) as a new tool to predict SFSS following hepatectomy.

**Methods:** Mice underwent either extended hepatectomy (86% partial hepatectomy (PH), SFSS-model) or 70% PH as a control group. Serial MRI on postoperative days 1–7 was used to compare specific changes in the course of early liver regeneration. Diagnosis of SFSS was based on survival, liver volume, proliferation markers and liver function parameters. Liver lipid content was assessed by in-phase and opposed-phase MRI, biochemical lipid quantification and Red O staining.

**Results:** MRI showed increased liver lipid content 48h and 72h after 86% PH (SFSS) compared to 70% PH controls (p = 0.0012 and p = 0.0262). Death due to SFSS was associated with a greater liver lipid accumulation related to SFSS. Survival was significantly decreased after 86% PH compared to 70% PH (p = 0.0043). Liver to body weight ratio was decreased 1–5 days after 86% PH compared to 70% PH. Phosphorylated histone 3 count peaked 48h after 70% PH and did not increase after 86% PH. Bilirubin serum levels were significantly elevated 24h and 48h after 86% PH compared to 70% PH controls (p = 0.0007 and p = 0.0003).

**Conclusion:** Early liver remnant lipid accumulation predicts SFSS following extended hepatectomy. MRI may be used as a new tool to diagnose SFSS in the early postoperative course.
Short-term outcomes after distal pancreactectomy: Laparotomy vs. laparoscopy—a single-center series

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Objective: Distal pancreactectomy (DP) is the first treatment option for surgical pathologies of the pancreas tail. DP has solely a resection part compared to pancreatic head resection where the reconstruction is as important, and often, technically more demanding. DP therefore represents an ideal indication for laparoscopic approach. Laparoscopic DP has been introduced already 15 years ago, but it is still not widely used and far away to be adopted as a standard approach. The study aim was to compare the postoperative complications and the length of stay (LoS) between open and laparoscopic DP.

Methods: A search of our institutional pancreas database was performed, and all consecutive patients who underwent DP from 2000 to 2015 were identified. Demographic characteristics, perioperative outcomes, and postoperative results were reviewed. Postoperative complications were graded using the Dindo-Clavien classification, and the LoS was calculated from operation day until discharge. Standard statistical tests were used.

Results: There were 103 patients who underwent DP during the study period (45 women, 60 men; median age 63 years). Seventy-nine cases were performed by an open approach and 26 by laparoscopy. The conversion rate was 7/26 (27%). Characteristics of both groups were similar. A splenectomy was associated to the DP in 65 cases (82%) in the open group and in 21 cases (81%) in the laparoscopic group. The proportion of tumors was similar in both groups (58/79 and 23/26, respectively, p = 0.177), most of them were adenocarcinomas. Overall complication rate was 41/79 (52%) in the open group and 9/26 (36%) in the laparoscopic group (p = 0.175). There were no differences between minor (grade I-II) and major (grade III-IV) complications (p = 0.277). Two patients died during the hospital stay (grade V) in the open group compared to 0 in the laparoscopic group (p = 1). The fistula rates were comparable (17/79 and 5/26, p = 1). In case of duodenal adenocarcinoma, the same rate of R0 resection was reached in both groups (15/22 and 8/10, p = 0.681). The median LoS was shorter for the laparoscopic group (8 vs. 12 days, p < 0.001).

Conclusion: Short-term outcomes after open and laparoscopic DP in terms of complication and mortality rates were similar, but LoS was significantly shorter in case of laparoscopic approach. Hence, laparoscopic DP should be offered to all suitable patients.

Patient monitoring through SMS after early discharge in enhanced recovery program after colorectal surgery

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Objective: Home discharge associated with enhanced recovery program (ERP) may increase risk after discharge, thus the home monitoring may be of interest. With nearly 180 billion text messages sent in France each year and a rate of subscriptions of 108% in French population, mobile telephony service is very popular, simple and fast. The French Federation of Digestive Surgery already validates SMS monitoring in ambulatory surgery. The Objective: of this study was to evaluate the feasibility of home SMS monitoring after elective colorectal surgery through ERP in GRACE Certified Reference Centers and to assess patient's satisfaction.

Methods: This prospective multicentric study was conducted between November 2014 and September 2015. All patients had colorectal surgery as part of an ERP program. Patients received SMS developed with Calmedica Company with 4 simple questions evaluating pain, transit, temperature and phlebitis in the 1st, 3rd and 5th day after discharge. An automatic alert was sent to the referring physician of each center as patients reported abnormal response or absence of response.

Results: One hundred and eleven patients were included to date and 1332 SMS sent. Responses were obtained in a median time of 12 (1–422) minutes and 90% of patients responded to all the SMS. Of the 48 alerts (3.6%) received by referring physicians, 27 (56%) were for postoperative pain (VAS > 4), 1 for phlebitis, 1 for disorder of transit and 19 for non-response. These alerts have led to hospital treatment for 4% of patients, with 3 readmissions (2.7%). In 2 patient emergency surgeries were needed (1 peritonitis due to anastomotic dehiscence, 1 evacuation). One patient was hospitalized for self resolving transit disorder. No mortality was recorded. The median score of patient satisfaction was 5 on a scale of 5 (85% response rate).

Conclusion: This study shows the feasibility and efficiency of home monitoring after discharge through SMS in the context of validated ERP after colorectal surgery under the supervision of a referent framework of surgeons. Patients respond overwhelmingly, fast and are highly satisfied with this support. Besides this monitoring SMS has many advantages, liberating nursing staff time, reduced out-patients clinic and emergency room congestion, reduces the workload of physicians and surgeon and gives the patient an active role as a player for his care.

The value of extended lymphadenectomy in distal oesophageal cancer

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Objective: Curative esophagectomy provides the best prognosis in patients with esophageal cancer. The extent of lymphadenectomy and its potential benefit has been controversially discussed over the last 2 decades. The aim of this study was to assess the benefit of an extended lymphadenectomy regarding survival.

Methods: 3087 patients with stage I-III distal esophageal cancer were identified from the Surveillance, Epidemiology, and End Results (SEER) database between 2004 and 2012. The impact of extended lymphadenectomy with 20+ retrieved regional lymph nodes (RLN) on survival was assessed using both multivariate Cox proportional hazards model and propensity score matching (PSM).

Results: In 727 patients (23.6%) 20+ RLN were retrieved. This rate increased from 14.1% in 2004 to 30.1% in 2012 (P < 0.001). The 5-year overall and cancer-specific survival in patients with 20+ retrieved RLN were 48.4% (95%CI: 44.0-53.2%) and 55.2% (95%CI: 50.8-60.0%) compared to 43.3% (95%CI: 40.9-45.7%) and 49.7 (95%CI: 47.3-52.3%) in patients with less retrieved RLN. Extended lymphadenectomy of 20+ RLN was associated with an increased overall survival in unadjusted (hazard ratio (HR) of death = 0.85, 95%CI: 0.75-0.97, P = 0.013) and PSM-adjusted Cox regression (HR = 0.78, 95%CI: 0.64-0.91, P = 0.002). Similar results were observed for cancer-specific survival in unadjusted (HR = 0.86, 95%CI: 0.75-0.99, P = 0.017) and PSM-adjusted COX regression (HR = 0.81, 95%CI: 0.69-0.97, P = 0.016).

Conclusion: Extended lymphadenectomy resulted in a significant survival benefit in unadjusted and PSM-adjusted population-based analysis. Therefore, extended lymphadenectomy should be advocated in all patients undergoing esophagectomy.

Evolving concepts and outcome in esophageal cancer surgery—a single center experience from the past to present

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Objective: Multimodal treatment concepts, modified surgical strategies and interdisciplinary approach have led to better outcomes in locally advanced esophageal carcinomas during the last decades. However debates regarding the surgical techniques and its influence on morbidity and the oncological outcome continue. The aim of this study was to investigate trends, results and evolution of esophagectomies for esophageal cancer during the past 30 years at a single institution with main focus on the last decade (15 years) with radical Trans Mediastinal Esophageal Resection including transthorax-in-bloc-lymphadenectomy (TME).
Methods: Patients undergoing esophagectomy for cancer between 1982 and 2015 were included. The study period was split into a historic (1982–2001) and a prospectively collected period (2001–2015) for comparison reason. Development of multiple variables on short and long-term outcomes were analyzed.

Results: Out of 584 esophageal resections, 543 patients with esophageal cancer were included in this analysis. The majority of patients were male (81%), the median (range) age was 64 (31–91) years. An increase in adenocarcinomas was detected (42%, 56%, 72%, p < 0.05) over time. Between 2001–15 66% of patients received a neo-adjuvant treatment. Perioperative mortality over time was 4.9%, 10.4%, and 1.1% (p < 0.05) while the overall 5-year survival improved (24%, 28%, and 59%, p < 0.05). The median number of harvested lymph nodes was 22 in the TME period (not consistently recorded before). Downstaging with RCT was achieved in 68% of the cases. 21% of the patients showed a complete response (pT0,pN0) in pathologic specimen.

Conclusion: Between 1982 and 2015 a significant reduction of perioperative mortality as well as an improved long-term survival after esophagectomy for cancer were achieved. The improved long term overall survival was associated with the less invasive TME including extended en-bloc lymphadenectomy, the multidisciplinary approach and the increased use of neoadjuvant chemoradiation.

Perioperative factors improving patient outcome after CRS/HiPEC

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Objective: Cytoreductive surgery (CRS) and hyperthermic intraperitoneal chemotherapy (HIPEC) is a multimodal treatment option with curative intent for well-selected patients with peritoneal tumors. Despite existing knowledge about the long learning curve for the surgeon, mostly including patient selection and technical experience, no such data is available for the anesthesiologist or other members of the team. Here we describe perioperative factors correlating with improved patient outcome after CRS/HiPEC with a focus on intraoperative management.

Methods: Patients (n = 112) after completed CRS/HiPEC between 2009–2014 were taken from a prospective database, and separated into Group A, including the first (n = 57) patients, and group B (n = 55) the patients operated after introduction of our multidisciplinary guidelines. The guidelines were introduced to standardize anesthesia in CRS/HiPEC, including patient monitoring, fluid management and coagulation.

Results: There was no difference between the two groups for age, gender, BMI, and comorbidity (Charlson index). More patients with DPAM (pseudomyxoma, p = 0.04) were observed in group B, and the disease load (peritoneal cancer index) was higher (p = 0.02), including more splenectomies (p = 0.01), liver capsule resections (p = 0.01), and colectomies (p = 0.05), with a higher dose of chemotherapy during HIPEC (p = 0.02) in group B. In contrast, in group B, the rate of major complications (p = 0.03) and reoperations (p = 0.01) was lower. Anesthesia was different in group B, including a higher use of coagulation factors (p = 0.08) and albumin (p = 0.001), less diuretics (p = 0.007), less invasive monitoring (p = 0.001). Temperatures remained at higher physiologic levels at the end of the operation (p = 0.005), and very low temperatures were avoided (p = 0.02). More patients were extubated in the OR (p = 0.02).

Conclusion: This data is novel and highlight the central role of the anesthesiologist to provide continuous and proactive maintenance of patient physiology without aggressive overcorrection as a critical part of a successful peritoneal surface malignancy program.
DaVinci group (450 min; p < 0.001). In each group we had one anastomotic leak. Severe complications (Clavien-Dindo grade III or IV) did occur in 4.7% and 4.8% respectively. On the resected specimen the number of harvested lymph nodes did not differ (mean 17). Three resections in the open group and two in the laparoscopic group were R1. Quality and completeness of the mesorectum was with a complete TME in 78% in the open group and 84% in the laparoscopic group (p = ns). Over the short follow-up time 3 patients (3.5%) developed a local recurrence and 6 patients (7%) distant metastasis, all in the open group. In the laparoscopic group neither one was observed.

**Conclusion**: Our perioperative results showed no differences in the laparoscopic technique compared to the open technique concerning hospital stay and perioperative morbidity. The groups are not randomized, so there is a bias for selection for the laparoscopic and the DaVinci group. The quality of the specimen is comparable. For a statement about oncological outcome, the follow-up is too short.

**Long-term outcome after non-operative management of blunt splenic and liver injuries**

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**Objective**: Little is known about the long-term outcomes of trauma patients undergoing non-operative management (NOM) for splenic and hepatic injuries. The aim of this study was to assess chronic abdominal pain, infectious complications, and adhesion-related symptoms in this patient population.

**Methods**: Patients with blunt liver and splenic injuries were extracted from the institutional trauma registry (TARN data base) from 01/2009-08/2013. After ethical approval, patients were interviewed either by telephone or by letter based on a specifically designed questionnaire. Long-term posttraumatic symptoms were assessed in univariable analysis, using student’s t-test for continuous variables and Fisher’s exact test for categorical variables.

**Results**: A total of 141 patients suffering liver and splenic injury and undergoing NOM were extracted. Of these, 80 patients responded (57%) and were further analysed. The mean Injury Severity Score (ISS) was 22 (SD ± 12), mean age was 45 (SD ± 20) years. There were 52 (65%) male patients, high-grade liver injuries were found in 19 patients (24%) and high-grade splenic injuries in 18 (23%). The most frequent mechanism of injury was motor vehicle accident (51%). Mean follow-up time was 50 (SD ± 18) months. Forty-five patients (56%) reported no long-term symptoms related to the trauma. The remaining 35 patients (44%) complained of at least one of the following: abdominal pain (n = 16, 20%), irregular bowel movements (n = 13, 16%), mild cognitive impairment/increased fatigue/feeling of weakness (n = 12, 15%), or infectious complications (n = 8, 10%). One woman reported secondary infertility. No significant association between the above mentioned symptoms and the ISS, presence of a haematoperitoneum, or high-grade injuries was found. However, patients suffering from low-grade injuries were significantly younger than asymptomatic patients (mean 39 [SD ± 18] vs 45 [SD ± 20] years, p = 0.023).

**Conclusion**: This study representing one of the longest follow-up observations for trauma patients with splenic and liver injuries revealed a considerable number of patients (44%) with trauma related symptoms. Interestingly, the injury grade, presence of haematoperitoneum, and ISS did not affect the investigated long term outcomes. However, long-term posttraumatic symptoms were significantly more frequent in younger patients.

**Laparoscopic Roux-en-Y gastric bypass provides superior long-term glycemict control than sleeve gastrectomy in morbidly obese patients—a systematic review and meta-analysis of randomized controlled trials**

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**Objective**: Bariatric surgery is the most effective treatment for morbid obesity and is currently renowned to have benefits for glycaemic control in patients with type 2 diabetes mellitus (T2DM) and for diabetes prevention. The preferred type of surgery and mechanism of action is however unclear. We performed a systematic review and meta-analysis of randomized controlled trials (RCT) comparing laparoscopic Roux-en-Y gastric bypass (GB) with sleeve gastrectomy (SG) concerning the optimal long-term glycaemic control.

**Methods**: A literature search of the Medline, Pubmed, Cochrane, EMBASE and SCOPUS was performed on 21st of November 2014 for RCT comparing GB with SG in morbidly obese patients. Primary outcome was improvement in postoperative glycaemic control. Secondary outcomes included weight related and lipid metabolism endpoints. Synthesis of these data followed established statistical procedures for meta-analysis.

**Results**: 16 RCT with a total of 1132 (566 in each group) morbidly obese patients were included in the analysis. Compared to patients that underwent SG, those that received GB had lower mean fasting serum glucose 24 months (Mean Difference [MD]: −17.95%; CI: −22 to −12 mg/dl, p < 0.001) and lower mean HbA1c 12 months (MD: −0.44, 95% CI: −0.68 to −0.19 mg/dl, p < 0.001) postoperatively. Similarly, when compared to SG, patients that underwent GB had a lower BMI 52 months postoperatively (BMI MD: −1.8, 95% CI: −2.9 to −0.7 kg/m², p < 0.001), lower low-density lipoproteins (MD: −17.7, 95% CI: −25.6 to −9.9 mg/dl, p < 0.001), lower triglycerides (MD: −5.6, 95% CI: −9.0 to −2.2 mg/dl, p < 0.001) and lower cholesterol (MD: −16.3, 95% CI: −26.7 to −5.9 mg/dl, p < 0.001) 12 months postoperatively.

**Conclusion**: Based on this meta-analysis, laparoscopic Roux-en-Y gastric bypass is more effective than laparoscopic sleeve gastrectomy concerning improved long-term glycaemic control, lipid metabolism and weight loss.

**Linear stapled gastrojejunostomy results in a lower stricture rate compared to circular stapled technique in laparoscopic gastric bypass surgery**

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**Objective**: Currently, there are two standard techniques to perform the gastrojejunostomy in gastric bypass surgery: The linear stapling and circular stapling technique. The aim of study was to compare the two techniques regarding postoperative morbidity and weight loss.

**Methods**: We compared two consecutive cohorts at a single institution between November 2012 and June 2014 undergoing gastric bypass surgery. The incidence of complications and weight loss at one year was assessed in 109 patients with the circular stapling technique (CSA) and 134 patients with the linear stapling technique (LSA).

**Results**: Preoperative BMI and incidence of comorbidities were similar in both groups. Postoperative complications were more frequent in the CSA group with 23.9% versus 4.5% in the LSA group (p < 0.0001). The main difference was the incidence of stenotic strictures, which occurred in 15.6% in the CSA versus 0% in the LSA. As a result, balloon dilation was required at least once in 15 patients. The rate of leakages, length of stay and weight loss at one year was similar in both groups.

**Conclusion**: Linear stapled gastric bypass displays less stenotic strictures with similar weight loss at one year compared to circular stapling technique.
Cortisol outperforms novel cardiovascular, inflammatory and neurohumoral biomarkers in the prediction of outcome in acute pancreatitis

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Objective: To compare the prognostic accuracy of copeptin, pro-adrenomedullin (pro-ADM), pro-atrial natriuretic peptide (pro-ANP) and cortisol in the prediction of organ failure or death in patients with acute pancreatitis (AP) and to assess whether these biomarkers are associated with the severity of AP.

Methods: From April 2011 to January 2015 142 consecutive patients with AP were included in this single center prospective study conducted at a tertiary referral center. Included patients had their pain onset within the last 96 hours and were observed for 4 days after study inclusion. Organ failure was assessed using the modified Marshall scoring system for organ dysfunction and severity of AP was assessed using the Atlanta 1992 and 2012 criteria, including the Ranson, APACHE II and modified Marshall Score. Blood samples were taken to measure the experimental biomarkers copeptin, pro-ADM, pro-ANP and cortisol, as well as the more established biomarkers C-reactive protein (CRP) and procalcitonin.

Results: During the 4 days of follow-up, 30 organ failures or deaths occurred in 116 (86%) patients with outcome data. With the exception of cortisol, the discriminatory ability to predict organ failure or death was modest for all biomarkers, with areas under the receiver operating curve (AUC) between 0.44 and 0.66. In contrast, cortisol showed an AUC of 0.78 and the APACHE II score one of 0.75 (Figure). Patients with moderate to severe AP showed significantly higher plasma concentrations of all six biomarkers as compared to those with mild AP. The association of copeptin, pro-ADM, pro-ANP or cortisol with the severity of AP was comparable to that of CRP, while the association of procalcitonin with the severity of AP was slightly stronger.

Conclusion: Cortisol seems to be the best candidate to predict short-term organ failure or death in patients with AP. Copeptin, pro-ADM, pro-ANP and cortisol are associated with the severity of AP compared to CRP, which is still considered the gold standard marker in AP. More data are needed to show whether a risk stratification using biomarkers translates into a better clinical management of patients with AP.

Outcomes of 41 consecutive transanal total mesorectal excisions for low rectal cancer

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Objective: Transanal total mesorectal excision (taTME) is an alternative to conventional mesorectal excision owing to its ability to achieve clear distal and circumferential resection margin in low cancers.

Methods: Consecutive patients treated by taTME were included in a prospective cohort study. Perioperative and short-term oncologic outcomes were measured along regular clinic visits and the results were reported as median and interquartile range (IQR). A prospective registry was maintained and outcomes were independently assessed.

Results: 41 patients with a low rectal cancer (6cm to anal verge, IQR 5–7) underwent a taTME between Feb 2013 and Nov 2015. Age and body mass index were 66 years (IQR 58–77) and 26.6kg/m² (IQR 24–30.9). 37% (26/66) patients had neoadjuvant radiochemotherapy. Median surgery time was 360 minutes (IQR 321–417.7), including an ileostomy. No statistical difference in surgery time was found when taTME was performed by one (n = 26, 373 minutes, IQR 331–422.5) or by two surgical teams (n = 15, 345 minutes, IQR 310.75–396.25). Median length of stay was 14 days (IQR 11–17). Dissection of the mesorectum was good (all Quirke 3) and all distal and circumferential margins were clear. Median T stage was 1 (IQR 2–3). 11 patients had lymphnode metastases for a median number of retrieved nodes of 24 (IQR 17–35.5). Last, cumulative 30-day morbidity amounted to 22% major complications (Dindo Clavien III-V), including 2 anastomotic leaks (4.9%) and 39% minor complications (Dindo Clavien I-II).

Conclusion: Transanal total mesorectal excision allows good surgical and oncologic quality to the expenses of a reasonable surgery time and morbidity.

Robotic gastric bypass surgery in the Swiss healthcare system: analysis of hospital costs and reimbursement

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Objective: Previous literature has demonstrated potential advantages of robotic Roux-en-Y gastric bypass when compared to conventional laparoscopy.
Impact of the Ultrasonic scalpel on the amount of drained lymph after axillary or inguinal lymphadenectomy

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Objective: Seroma formation and lymphoedema following radical lymph node dissection (RLND) are complications frequently encountered. One potential strategy to reduce the incidence of these complications is the use of Harmonic Scapel. A recent randomized trial showed a higher rate of lymphoedema in patients who underwent RLND with harmonic scalpel suggesting an over-sealing of the lymphatic vessels. The aim of the present prospective study was to evaluate the impact of harmonic scalpel on the amount of drained lymph after RLND.

Methods: Between 2009 and 2013 in a tertiary academic centre, patients undergoing inguinal or axillary RLND or completion lymph node dissection for melanoma, squamous cell carcinoma or sarcoma, were randomized in a controlled trial comparing the impact of two surgical dissection techniques on drained lymph. In group USS, dissection was conducted with Harmonic Scalpel and in group control by ligation and monopolar electrocautery. At the end of the procedure a closed Redon suction drain was placed in the groin or in the axilla. The daily amount of drained lymph in 24 hours was measured. The primary endpoint was to compare the quantity of post operative drained lymph in both groups. Secondary endpoints were the comparison of drained lymph with BMI, gender, and surgical site (axilla, groin).

Results: 80 patients were enrolled in this trial. 40 patients were randomly assigned in group USS and control respectively. No significant difference was observed in the total volume of lymph drained (USS: 2988 +/- 2453 ml vs. C: 3898 +/- 5791 ml; p-value = 0.382). Moreover, no significant difference on the amount of drained lymph was measured after adjusting for gender, age, and BMI. A significant higher amount of lymph was measured after inguinal dissection compare to axillary (p = 0.032).

Conclusion: The use of Harmonic scalpel did not decrease the amount of lymph drained after RLND. Thus the present study does not support support theories concerning an over-sealing of lymphatic vessel with the use of Harmonic Scalpel. Inguinal RLND lead to a higher amount of lymph drained compared with axillary RLND.
Methods: We identified 122 patients who underwent splenectomy between 1986 and 2008. The aim of our study was to determine the vaccination rates, the quality of education and the complications. Preventive measures such as immunization, antibiotic prophylaxis and detailed education of splenectomized patients can reduce the risk of life threatening infections.

Conclusion: Complex surgery of the upper gastrointestinal tract in the very elderly patients is safe but associated with higher costs. Those operations can be performed without a financial loss in the DRG system in Switzerland though private fund the general insured patients. Future adjustments to the system might have to be made to make non-private insured cases more sustainable.

Gastrointestinal Quality of Life Index (GIQLI) after laparoscopic Toupet fundoplication. Long term follow-up

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Objective: Besides lifestyle modification, pharmacological management is the standard initial therapy for GERD, including proton pump inhibitor. So the number of anti-reflux surgery is decreasing. If fundoplication is needed, there is still an ongoing discussion which technique (Toupet versus Nissen) shows better results. Toupet is the treatment of choice in terms of a low dysphagia rate postoperatively. Even though the recurrence rate is mentioned to be higher. In this study we compared our data (laparoscopic Toupet Fundoplication) versus literature, in terms of quality of life, dysphagia and recurrence rate.

Methods: We assessed the quality of life of all patients treated by laparoscopic Toupet technique between 2003–2014. Data was evaluated for preoperative symptoms, symptoms at time of the last follow up, demographics and morbidity. The Gastrointestinal Quality of Life Index (GIQLI) was determined by standardized questionnaire.

Results: Out of the 139 patients (94 female and 45 men), who underwent laparoscopic Toupet fundoplication, 85.6% (119 patients) returned the questionnaire. The average age was 63.5 years (21–87), BMI 28.35 (18.3–40.7), ASA 2.18 (1–3) and mean duration of postoperative hospital stay 7.31 days (3–34). Mean follow-up time was 50 months (5–135). In terms of preoperative symptoms heartburn was mentioned most (79.4%) followed by regurgitation (61.9%). At time of last follow up 67% quoted that heartburn resolved and in terms of regurgitation there was an improvement of 71.8%. 16% of the patients had complications. One person suffered from heavy dysphagia and needed regular dilations. Mortality was 0% and the recurrence rate was 8.4%.

Conclusion: The GIQLI score in the study group is well comparable to the score of a healthy population (120.8 points). In our data collection the laparoscopic Toupet Fundoplication goes along with a good quality of life. Compared to the literature there is a low heavy dysphagia rate (0.8%) and an assymilable recurrence rate (8.4%).

Preventing postsplenectomy infections: results from a 10-year single centre experience regarding patient awareness and postsplenectomy immunization

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Objective: Splenectomy is associated with a lifelong increased risk of infections and sepsis. Preventive measures such as immunization, antibiotic prophylaxis and detailed education of splenectomized patients can reduce the risk of life threatening infections.

The aim of our study was to determine the vaccination rates, the quality of education as well the current state of knowledge of patients who have undergone splenectomy in our hospital.

Methods: We identified 122 Patients who underwent splenectomy between January 2002–December 2011, due to hematological diseases, traumatic or iatrogenic spleen injury as well as atraumatic-idopathic splenic rupture. A retrospective analysis of data concerning the type and time of postsplenectomy immunization was performed. The 102 patients (84%) who were assumed to be alive at the time of our survey, received a standardized questionnaire to determine the quality of the information received at hospital discharge, the current knowledge about general implications of splenectomy as well as the need for vaccinations.

Results: The overall vaccination rate was 81% (84 of 102 patients) of whom all (100%) received a vaccination for Streptococcus pneumoniae, 65% (55/84) for Neisseria meningitidis and 44% (37/84) for Hemophilus influenza type b, mostly within a range of two weeks pre- or postoperatively. Only 12% (10/84) of the patients received a seasonal Influenza vaccination. 34% of the patients (35/102) completed the questionnaire. 84% of the respondents (29/35) recall to have been educated about the implication of splenectomy, although only 40% (14/35) rate their education as sufficient. Specific knowledge about travel precautions or the risk of sepsis when suffering an animal bite, were stated by 26% (9/35) and 9% (3/35) respectively. 71% (25/35) recall receiving education on postsplenectomy immunization and 34% (12/35) know when the next vaccination was scheduled.

Conclusion: Although our overall vaccination rate correlates with those found in similar studies, our goal should be to maintain a 100% vaccination rate for all three vaccines. The level of patient knowledge is insufficient. In an attempt to improve the quality of education, we provide each patient with a personalized splenectomy identification card, including written information as well as a vaccination protocol.
Boost the biopsies: the Imunoscore has the potential to predict outcome of colon cancer
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Objective: A potent lymphocytic reaction is associated with improved long-term outcome in colon cancer. A new methodology, the so-called “imunoscore” (IS) has recently been developed to quantify the type, density and location of immune cell infiltrates within tumors. However, the IS has only been validated on surgical specimens and not on preoperative tumor biopsies. This current study aimed to evaluate the feasibility and predictive value of the IS on tumor biopsies.

Methods: The density of total (CD3+) and cytotoxic (CD8+) T lymphocytes was evaluated by immunohistochemistry and quantified by a dedicated image analysis software in two different areas (center of tumor and microenvironment) of 10 tumor biopsies and surgical specimens of stage I to IV colon cancer patients. For each area (center of tumor and microenvironment), three different zones were analyzed and the mean number of lymphocytes was calculated. The IS obtained on the tumor biopsy was correlated with the one obtained on the surgical specimens and with tumor stage, respectively.

Results: The density of CD3+ lymphocyte infiltration in tumor biopsy significantly correlated with the total density of CD3+ in surgical specimens (p = 0.07). High infiltration of CD3+ lymphocytes in tumor biopsies was positively associated with higher CD3+ infiltration in the center of the tumor (p = 0.03), but not in the microenvironment (p = 0.31) of the surgical specimens. No significant associations were found for CD8+ lymphocyte densities. CD3 densities in tumor biopsies were associated with earlier tumor stages.

Conclusion: The quantification of the CD3+ lymphocytes within tumor biopsies is feasible and similar to CD3+ counts within the tumoral core of colon cancer. Therefore, the IS of tumor biopsies may offer important preliminary information on patient’s outcome and response to anti-cancer therapies. Until now, such information could only be obtained on surgical specimen.

Long-term outcomes of CRS/HIPEC in a Swiss single center
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Objective: Hyperthermic Intraperitoneal Chemotherapy (HIPEC) is an intraoperative chemotherapy protocol developed in the eighties to treat peritoneal carcinomatous. Combined with Cytoreductive Surgery (CRS), it can extend survival and even cure some patients at the price of a high morbidity and mortality. Since 1996, we have been performing in our division, a CRS/HIPEC protocol for periportal metastasis of Colorectal Cancer (CRC), Gastric Cancer (GC), Ovarian Cancer (OC), Pseudomyxoma Peritonei (PMP), Mesothelioma (M) and even atypical cancers. We used a closed technique for the administration of chemotherapy.

The aim of this study was to report our long-term experience with this technique.

Methods: Retrospective review of all patients treated by CRS/HIPEC from 1996 to 2015 was conducted. Demographic and perioperative data were retrieved, as well as oncological status and survival.

Results: During the study period, we performed 100 procedures in 98 patients (repeat HIPEC in two): 40 for CRC, 20 for PMP, 18 for GC, 16 for OC, 5 for M and one for a rare peritoneal tumor. HIPECs were performed using mostly Mitomycin C (43%) alone, Mitomycin C and Cisplatin (26%) or Oxalipatin (21%). Median age was 53 years old (15–72). There were 64 % female and 87% of patients had an ASA score of II.

The 30 days postoperative morbidity (Clavien-Dindo = IIIb) was 18% while the 90 days mortality was 3% (0% at 30 days). Median follow-up was 25 months (range 0–171), overall median survival was 42 months (95% CI 21.6–62.5) for CRC, 89 months (95% CI 54.3–123.7) for OC and 26 months (95% CI 8.7–43.3) for GC. Mean overall survival was 165.7 months (95% CI 148.2–183.3) for PMP and 64 months (95% CI 31.6–97.2) for M.

Conclusion: Our results show that CRS/HEIPC has a very significant role in oncological surgery for selected patients, despite a high morbidity rate. This is especially true for ovarian cancer, colorectal cancer and PMP, indications presently well accepted. In Gastric cancer, very strict selection criteria have to be applied.

Postoperative pancreatic fistula—validation of the International Study Group of Pancreatic Fistula (ISGPF) definition
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Objective: The aim of the study was to validate the ISGPF Definition and Classification of postoperative pancreatic fistula (POPF) on the basis of the cohort of patients after pancreatic surgery in our single institution pancreatic surgery center.

POPF is the most common major-complication following pancreatic surgery.

Methods: This is a retrospective analyze of all patients underwent pancreatic surgery during a 7 years period out of a prospective database. Included were all of the following operating-procedures: pancreatic head resection (PHR), left pancreatic resection (LPR) and other resections. All patients were analyzed regarding the definition and classification of POPF (grade A, grade B and grade C) and the postoperative interventions, re-operations and surgical mortality. Classification grade B was modified including all patients needed interventional drains within a clinical stable condition (grade B*, which results in grade C).

Results: During the period 84 pancreatic resections were performed (68% PHR, 24% LPR, 8% others). POPF occurred in 19.4% (7.7% grade A, 4.4% grade B, 7.3% grade C vs. 8.9% grade B*, 2.9% grade C*). After modification grade B* fistula were significantly more often than grade B following LPR. The length of postoperative hospital stay (LOS) was significant longer in the group grade C* than grade C. The allow mortality was 1.9% (n = 17), n = 14 caused by surgical complications, n = 9 (57%) caused by POPF and the further complications. These are 15% of all grade C- and 18% of all grade C*-fistulas. The mortality rate following PHR was 2.1%, following LPR 1%.

Conclusion: The ISGPF-definition shows a good detection of postoperative pancreatic fistula. But based on missing clinical and therapeutic consequences grade A fistulae should not be defined as major complications. Furthermore patients with fistulae required interventional drains while having a clinical stable constitution should be allocated to grade B. There should be a differentiation between fistulae following pancreatic head and left pancreatic resection due to the fact that fistulae following LPR are less “precarious” regarding outcome and clinical situation. Therefore, based on our data, the definition of the ISGPF should be modified.

Exercise-based lifestyle intervention for non-alcoholic fatty liver disease: a systematic review, meta-analysis and meta-regression
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Objective: Non-alcoholic fatty liver disease increases the risk of complications in liver surgery, and ways to improve this condition should be considered in preparing patients prior to surgery. We assessed the effectiveness of exercise-based lifestyle interventions on liver-specific endpoints in populations with non-alcoholic fatty liver disease and underlying metabolic disorders such as obesity, type-II diabetes or the metabolic syndrome.

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Evaluating the quality of liver resections for colorectal liver metastases using a standardised definition of the difficulty to obtain R0 surgical margin

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Objective: Liver resections can be performed safely in a number of programmes. The usual parameters of mortality and morbidity do not provide enough information about the quality of the resections, which must take into account how close the aim of surgery (i.e. R0 removal of the tumour) has been obtained in relation to its theoretical possibility.

Methods: We standardized the difficulty of obtaining an objective R0 resection by the distance of the lesions from anatomical structures to be preserved: Type I: ≥10mm (R0 resection easy to obtain), Type II: 9-3mm (intermediate), type III: <3mm. We analysed the simultaneous experience of liver surgery for colorectal liver metastases (CRLM), recorded in a prospective database, in the two settings of our joint hepatobiliary program UH/RH (University Hospital/Regional Hospital). Radiological, surgical and pathological data were reviewed retrospectively, the distribution of the events was analysed by the x²-test.

Results: In the 4 years 2012–2015, 154 hepatectomies for CRLM were performed, of which 104±50 at UH/RH, respectively. Mortality Clavien 3 occurred in 5±0 (5±0%), Clavien 4 in 3±1 (3±2%) and mortality was 0±0; blood transfusions were given in 8±2 patients (8±4%) (p = NS). Liver resections type I were 56±41 (54±82%), type II 24±3 (23±10%), and type III 24±4 (23±8%) (p = 0.002105). In the subgroup L, “first shot” R0 resections (i.e. without further recuts) were obtained in 50 of 55 (99%) patients at UH and in 36 of 41 (88%) at RH: (p = 0.93784); in group II in 8 of 24 (33%) at UH and 5 of 5 (100%) at RH (p = 0.006394). In type III lesions, R0 and R1-vascular (as opposed to R1-parenchymal) resections were obtained in 19 of 24 (80%) patients at UH and in 4 of 4 (100%) at RH.

Conclusion: The types of hepatectomies were highly associated to the probability of R0 resection. While the distribution of the types of hepatectomy was different at UH and RH, the rate of R0 histology in type I, resections was similar, suggesting that the aim of an equivalent quality of the procedures had been reached. The classification may prove useful for benchmarking of quality related targets in liver surgery (e.g. when using innovative techniques or when assessing the influence of tutoring).

ERAS, stay hospital and private insurance

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Objective: Hospital discharge after colorectal resection within an ERAS program often occurs later than what objective discharge criteria (Fiore1) could allow. After a first retrospective analysis of our data in 2014, we introduced a new patient diary to collect prospectively the Fiore criteria and the reason for discharge delay and also sensitize our team to avoid unnecessary hospital stay extension. The aim of this study was to analyse the efficacy of this measure and the risk factors of discharge delay.

Methods: All electively admitted patients for colorectal resection at our hospital in 2014 and 2015 were included in the ERAS database and included in the study. The post-operative day on which patients fulfilled the Fiore criteria2 for readiness to discharge (POD-F) and the effective day of discharge (POD-D) were determined retrospectively (Jan 2014–June 2015, 107 (78%) patients) and prospectively (July 2015–Dec 2015, 31 (22%) patients). We analysed the reasons for discharge delay (POD-D>POD-F) and performed univariate and multivariate analysis to determine risk factors.

Results: We included 138 patients (52% female) with a median age of 69 (20–89); 33% underwent a rectal resection and 66% had malignant disease. Median POD-F was 5 (2–48) days, POD-D was 6 (1–50) days. In 94 patients POD-D occurred a median of 1 (1–11) days later than POD-F. Reasons for discharge delay were insufficient social support in 13 (14%), patient’s preference in 39 (41%) and medical team preference in 41 (44%). In one patient hospital stay was extended to allow a neurological intervention. There was no difference in demographic data, rate, length and reasons for discharge delay between the retrospective and the prospective cohort. Private insurance (OR: 2.61 95% CI 1.08–6.34, p = 0.034) and patient discharged on a day other than Monday (OR: 2.94 95% CI: 1.16–7.14, p = 0.023) were independent predictors for discharge delay. The reason for discharge delay significantly predicted the length of delay, it was longest for insufficient social support (mean 3.8 days, 95% CI: 1.87–5.67, p < 0.001).

Conclusion: The introduction of a specific patient’s diary with objective discharge criteria did not decrease the rate of discharge delay. Private insurance seems to be one of several non-medical factors that prolong hospital stay. Waiting for post-acute care created the longest delays.

General Surgery and Traumatology

Prophylactic intraperitoneal onlay mesh reduces the risk of incisional hernia after laparotomy–two year follow-up results from a randomized controlled trial

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Objective: It is assumed that incisional hernias occur in up to 20% of all open abdominal surgeries. This study examines the use of a prophylactic intraperitoneal onlay mesh (IPOM) to prevent incisional hernia following median laparotomy.

Methods: This prospective, randomized controlled trial was started in August 2008. Patients undergoing median laparotomy were randomly allocated either to abdominal wall closure according to Everett with a PDS-loop running...
Current surgical residents value most a structured teaching environment with active involvement in the operating room, fun and interest in everyday's work, and good working relationships over working hours regulations, salary, and prestige. Surgical leaders may take this into account when shaping a teaching and working environment that attracts and retains the surgeons of generation Y.

The more the better: Lower rate of stage migration and better survival in patients with retrieval of 20 or more regional lymph nodes in pancreatic cancer. A population based propensity score matched and trend SEER analysis


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Objective: To assess the influence of regional lymph node retrieval (RLN) on stage migration and survival in pancreatic cancer patients.

Methods: A total of 7,685 stage I and II pancreatic cancer patients were identified in the Surveillance, Epidemiology, and End Results database between 2004 and 2011. The impact of RLN on overall and cancer-specific survival was assessed using Cox proportional hazard regression models with and without risk-adjustment and propensity score methods as well as join-point regression analysis.

Results: In 2,799 patients, 1–10 RLN were retrieved, in 1,971 patients 11–19 RLN, and in 1,807 patients 20+ RLN. The rate of node-positive pancreatic cancer was steadily increasing with the number of retrieved RLN. This trend continued beyond 10 retrieved RLN (P < 0.001). In unadjusted analysis, retrieval of RLN did not influence survival (P = 0.178). When adjusting for a significant bias in staging variables (P < 0.001), retrieval of 20+ RLN compared to 11–19 RLN was associated with an increased survival in node-negative cancer (hazard ratio of death = 0.78, 95% CI: 0.62 to 0.98, P = 0.033) and in node-positive cancer (hazard ratio of death = 0.83, 95% CI: 0.74 to 0.93, P = 0.002).

Conclusion: This is the first population based propensity score adjusted investigation demonstrating that an extended retrieval of RLN in pancreatic cancer lowers the rate of stage migration and is associated with a better oncological outcome in node-negative and positive cancer. Contradictory results may be explained by a bias in the cancer characteristics for a different extend of RLN retrieval.

Colon surgery education in Switzerland: The gap between wishes and truth

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Objective: The quality of surgical education in Europe is a matter of continuous debate. Segmental colonic resections are claimed to be surgical procedures typically taught to surgical trainees. We aimed to assess the percentage of segmental colonic resections taught to Swiss residents in the last decade and to identify factors that influence the percentage used for surgical training.

Methods: Based on the nationwide prospective sample of the AQC (Arbeitsgemeinschaft für Qualitätssicherung in der Chirurgie) all segmental colonic resections (ileocolic resection, right- and left hemicolectomy, and sigmoid resection) performed at participating centers between 2005 and 2014 were identified. The hierarchical position of the surgeon performing the individual operation was assessed. The number of resections taught to residents was compared to the number performed by senior surgeons (chairmen, junior and senior staff surgeons). Subsequently, factors predictive for procedures to be performed by residents in training were analyzed.

Results: All segmental colonic resections (n = 5558) were identified and divided into the following categories: ileocolic resection (n = 434), right-hemicolectomy (n = 1840), left-hemicolectomy (n = 816) and sigmoid resection (n = 2468). Only 5.3% of all the colon resections between 2005 and 2014 were taught to residents: 3.9% (2005), 6.1% (2006), 11.0% (2007), 8.5% (2008); 7.5% (2009), 4.6% (2010), 5.1% (2011), 5.6% (2012), 2.5% (2013), and 3.6% (2014). Factors that predict increased training rates include: “A” status
Fracture testing of cadaveric femurs after standardized, minimal-invasive elastomer femoroplasty: An in vitro biomechanical study

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Objective: Osteoporosis is a common disease worldwide. According to the WHO, hip fractures are the most serious osteoporotic fractures. Due to changes in population demographics, the incidence of osteoporotic hip fractures is rising and the socioeconomic burden is escalating. In recent years, femur augmentation using bone cement (PMMA) to enhance the mechanical properties – Femoroplasty – is a potential alternative solution for patients with high risk of osteoporotic fracture. The objective of our study was to test the hypothesis:

1. A new controlled minimal-invasive Femoroplasty method increases the mechanical stability of proximal osteoporotic femur in a simulated fall to the side model.
2. The hollow tube shape of the new method allows reducing cement volume while still enhancing the mechanical properties of the augmented femurs similar to existing Femoroplasty methods.

Methods: We designed surgical tools to place PMMA as a hollow shaped tube into the critical area of the proximal femur in a controlled and minimally invasive way. Ten pairs of fresh human cadaveric femur bones of individuals over 70 years were treated with our developed tools for Femoroplasty. The procedure was performed on one bone of each pair, the contralateral served as a reference. A Computer tomography (CT) of each femur with femoroplast treatment was performed to document the PMMA injection. All femora were then fixed in a device with Hayes-fall configuration and compressed until fracture occurred.

Results: The CT results showed that we reproduced and placed reliably and accurate the presumed hollow shaped tube of PMMA. In all femora we did not use more than 10 cc of PMMA. The biomechanical tests showed that femora underwent significant strengthening through Femoroplasty rising the mean yield load and yield work up to 33.2% in comparison to the reference femora.

Conclusion: In comparison with existing studies we developed tools and technique to perform a femoroplastic procedure in a standardized way. Surgically our procedure is easy reproducible and mini-invasive. Furthermore, by producing a hollow shaped tube we could diminish constantly the used PMMA to the lowest volumes described until now in literature while getting high stability in comparison with other biomechanical tests. We are convinced that our study is an important contribution to develop preventive surgical strategies for osteoporotic femur fractures.

Clinical results of arthroscopic postero-superior “anatomical footprint” rotator cuff repair: A consecutive prospective case series of 76 patients

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Objective: The debate is ongoing whether a single or a double row rotator cuff repair is more favorable. In recent literature “pros” and “cons” are mentioned for each technique. We prefer in certain lesion types a technique that allows the anatomical restoration of the “foot print” and simultaneously neutralizes the muscle forces. In addition, this technique has all the advantages of a double row repair. It was our goal to analyze the results of our technique in a single institution case series.

Methods: All patients between 01.01.2012 and 31.12.2014 with a postero-superior (PSUP) anatomical footprint reconstruction (AFR) were recorded. We enrolled 76 patients with a mean age of 58.2 years (range 30-78 years). Isolated PSUP lesions were treated in 33 patients, while 43 patients suffered from an additional subscapularis (SSC) lesion which needed additional treatment (16 low grade I/II and 27 high grade III/IV according to Lafosse). All interventions were performed in a standardized fashion in general anesthesia and with an interscalene catheter. The PSUP AFR consisted of a medial row with U-stitches or lasso loops, a single double loaded anchor to reduce PSUP to the correct position and a suture bridge reconstruction. The SSC was repaired with a lasso loop in grade I or II lesions and in higher grade cases in a pseudo double row technique. The postoperative (ps.) protocol was standardized with an abduction pillow and a final clinical control after one year.

Results: After one year 71 patients (93.4%) had a final clinical examination. Two patients (2.6%) were lost to follow up and three (4%) cancelled their last visit due to an absolutely satisfying result. The Constant–Murley–Score (CMS) significantly (p<0.05) improved from 49.6 (21–86 pts.) to 86.2 (36–100 pts.). Noteworthy, subcategories in CMS as pain and strength improved significantly. The clinical testing of the cuff also ameliorated significantly (p<0.05). We recorded 7 complications: three clinical clear re-ruptures, two capsulitis, one anchor dislocation and one Propioni acnes infection. Patient satisfaction was high with 3.6 points (1 bad to 4 excellent).

Conclusion: Arthroscopic footprint cuff repair seems to be a valuable tool for complex lesions with the only disadvantage of higher costs. This technique provides excellent clinical results and high patient satisfaction but there was no po. control by MRI or contrast enhanced CT.

Does teaching of surgical procedures influence the in-hospital outcome of patients with a proximal femoral fracture?

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Objective: Teaching of surgical procedures is of paramount importance. However, the cost and time constraints limit the opportunities to teach. The aim of this study was to evaluate if teaching is a significant predictor for inpatient death, complications and length of stay after surgical care of hip fractures recorded in the AQc database (Arbeitsgemeinschaft für Qualitätssicherung in der Chirurgie).

Methods: We retrospectively analyzed all hip fracture patients recorded in the AQc database between 2008 and 2013. The inclusion criteria were ICD-10 diagnostic codes S72.00 to S72.11 (proximal hip fractures). Further, patients must have been operated and the teaching status of this procedure must have been reported. The cohort included 4397 patients with a mean age of 80 years. Fifty percent of these patients had a per trochanteric fracture and 48% had a femoral neck fracture. Per trochanteric fractures were treated most frequently with closed reduction and internal fixation (68%), femoral neck fractures with hemi-arthroplasty (53%). Forty eight percent of the procedures were conducted as teaching interventions. The mean length of surgery was 94 minutes for the group with versus 84 minutes without teaching. Variables were sought in bivariate and multivariate analyses. Teaching status was entered in multiple regression analysis models for death, complications and length of stay while controlling for confounders.

Results: The overall mortality rate was 4.5%. Teaching status was not a predictor for mortality. A higher ASA score was the strongest associated risk factor for inpatient death. Fifteen percent of patients suffered at least one complication. Teaching of a procedure did not influence the rate of complications. A higher ASA-score and the need for antibiotic therapy were the main predictors of complications. The mean length of stay was 11 days. Teaching was associated with a longer hospitalization as well as age, a higher ASA-score, the need for antibiotic therapy and adverse events.
Conclusion: Teaching of surgical procedures had no influence on in-hospital death and complications in patients with a proximal femoral fracture. However, teaching was an independent predictor of a longer length of stay. Older patients with a higher ASA and concomitant injuries are at risk for a negative outcome. This study did not evaluate the costs and the long-term effects of teaching.

Impact of mucinous histology on the prognosis of stage I-III adenocarcinomas of the appendix: A population-based, propensity score matched analysis

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Objective: Whereas the poor prognosis of signet ring cell adenocarcinomas of the appendix is well known, the significance of a mucinous histology remains unclear. The aim of this population-based study was to evaluate if mucinous histology is an independent prognostic factor in appendiceal adenocarcinomas.

Methods: Patients with stage I-III adenocarcinoma of the appendix who underwent surgery between 2004 and 2012 were identified in the Surveillance, Epidemiology, and End Results database. Overall survival (OS) and cancer-specific survival (CSS) were assessed using risk-adjusted Cox proportional hazards regression models and propensity score methods.

Results: Overall, 980 patients with appendix cancer were included, of which 449 (45.8%) had a mucinous histology. In an unadjusted analysis, the 5-year OS and CSS in patients with a mucinous adenocarcinoma (MC) was 76.8% (95% confidence interval [95% CI]: 72.1-81.7%) and 81.0% (95% CI: 76.6-85.6%) compared with 70.0% (95% CI: 65.1-75.3%) and 76.2% (95% CI: 71.5-81.2%) in patients with non-mucinous adenocarcinoma (NMC) (P = 0.082 and P = 0.568). In multivariable analysis, no impact on survival was observed for OS (HR = 1.22, 95% CI: 0.89-1.68, P = 0.206) and CSS (HR = 1.21, 95% CI: 0.84-1.74, P = 0.296). After propensity score nearly identical survival rates were observed (OS: HR = 1.01, 95% CI: 0.71-1.49, P = 0.881 and CSS: HR = 1.05, 95% CI: 0.70-1.59, P = 0.803).

Conclusion: The present population-based, propensity score matched analysis shows that mucinous histology does not affect survival in stage I-III appendiceal adenocarcinoma patients. Therefore, the same treatment strategies can be applied for patients with NMC and MC of the appendix.

Mortality rate was 32% in patients with and 23% in patients without CIN. Older age (OR 1.02), new para-/tetraplegia (OR 5.9) and pre-existing musculo-skeletal diseases (OR 4.5) were identified as independent risk factors for CIN. CIN itself significantly increased the risk for hemodialysis (OR 4.8). However, CIN was not a risk factor for mortality nor complications while controlling for concomitant injuries, comorbidities, age, and sex. The length of stay was also not affected by CIN.

Conclusion: The incidence of CIN (14%) was slightly higher compared to other studies. This is possibly due to our inclusion criteria, since only severely injured patients were included in our study. We found age, plegia and musculo-skeletal diseases as risk factors for CIN. CIN itself did however not affect in-hospital outcome except for hemodialysis.

Major influence of interobserver reliability on polytrauma identification with the Injury Severity Score (ISS): Time for a centralized coding in the Swiss Trauma Registry?

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Objective: Since 2015, all designated trauma centres in Switzerland have been committed to provide defined patient data sets to the Swiss Trauma Registry (STR), including the Abbreviated Injury Scale (AIS) and the Injury Severity Score (ISS). Among other parameters, these scores shall be used to compare treating institutions regarding trauma burden and outcome of severely injured patients, with the aim of optimizing resource allocation and patient outcome. However, reliability of these scores may be compromised by the complexity of the coding systems and interobserver reliability. As every trauma centre is responsible for its own coding and data input, this study aims at evaluating interobserver reliability of AIS and ISS coding.

Methods: Interobserver reliability of the AIS and ISS is analyzed from a cohort of 50 consecutive severely injured patients treated in 2012 in our institution. Coding was performed retrospectively from medical records by 3 independent and specifically trained observers.

Results: Despite median differences in ISS of 3 points (range 0–17), the intraclass correlation coefficient was 0.975. Considering a cutoff ISS ≥ 16, only 38 patients (76%) were identified uniformly as polytraumatized or not. Increasing the cutoff to ≥ 20, this increased to 41 patients (82%). A difference in the AIS of ≥ 1 was present in 261 (16%) of possible codes, but this is biased by the fact that a large majority of body regions had no injury. Excluding all body regions were the 3 observers unanimously identified no injury, a difference of ≥ 1 was present in 91 of 193 (47%) and ≥ 2 in 21 of 193 (11%) injured body regions. As this corresponds to 94 of 579 possible observer pairings, differences in AIS of ≥ 2 points have been observed in 16%, approximately every 6th case.

Conclusion: Even if corresponding interobserver correlation coefficients appear to be within ranges commonly accepted as moderately good, it appears that injury severity is not identified correctly or consistently when using the AIS. This leads to wrong identification of severely injured patients using the ISS. Improving consistency of coding, such as through centralization, would thus be recommended before scores based on the AIS are to be used for interhospital benchmarking and resource allocation in the treatment of severely injured patients.

 contrast-induced nephropathy (CIN) in polytraumatized patients

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Objective: Contrast enhanced whole body CT is more and more routinely performed for the initial evaluation of severely injured patients. The nephrotoxic effects of the intravenous contrast agent have been well investigated in injured patients. The nephrotoxic effects of the intravenous contrast agent have been well investigated in patients undergoing coronary angiography. However, little is known about the contrast-induced acute kidney injury in trauma patients.

The primary goal of this study was to determine the prevalence of CIN at a Level I trauma center. Further, independent risk factors for the development of CIN and the clinical implications were investigated.

Methods: The electronic medical records of all trauma patients admitted to the resuscitation area of our Level I trauma center between 2008 and 2014 were retrospectively reviewed. Inclusion criteria were pre-clinical intubation and i.v. contrast enhanced whole body CT at admission. Exclusion criteria were missing initial serum creatinine levels (SCr) or missing follow up levels within 72 hours. Two hundred and eighty four patients with a mean age of 47 years met the criteria and were further analyzed. CIN was defined as a relative increase in SCr ≥ 25% over the baseline value or an absolute increase of > 44 μmol/l within 72 hours. Bivariate and multivariable regression analyses were performed to identify significant risk factors. Therefore all p-values < 0.01 were included. A p-value < 0.05 was considered statistically significant.

Results: Forty one patients (14%) met the criteria for CIN. Six patients (15%) had hemodialysis in the CIN-group and 8 (3.3%) in the group without CIN.
Methods: Single centre retrospective case series of 167 consecutive patients, operated with ORIF for distal radius or ankle fractures in 2014. Fractures were classified according to the AO classification. Intra-operative radiographs were not standardised. Postoperative files were evaluated if the postoperative radiographs did lead to a change in treatment protocol. Changes in treatment protocol were defined as additional CT-imaging, reoperation or other changes as defined in the postoperative orders.

Results: In 7.2% (12/167) of the patients, a change in the treatment plan was recorded after the postoperative radiographs. Ten patients (6%) were reoperated (three without additional imaging, seven after additional imaging with CT). Of these 10, 8 required a reosteosynthesis. Two patients had additional imaging (CT) without further consequences. There was no statistical difference between changes in the treatment plan depending on night or daytime surgery or if the surgeon was a resident or consultant and also independent of the fracture classification.

Conclusion: Standardised postoperative radiographs led to over 7% changes in the postoperative treatment protocol. Moreover, 6% of the patients required a second operative procedure. These numbers are high and suggest that standardised postoperative radiographs do add to the quality of fracture care. In the future, standardised intra-operative radiographs will be defined at our institution in order to prevent the need of postoperative radiographs.

Characteristics and functional outcome in survivors of severe trauma with versus without major brain injury

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Objective: Considering the limited data in recent literature we investigated the trauma characteristics and long-term outcome of severely injured depending on whether they sustained major traumatic brain injury (mTBI) or not.

Methods: Prospective Swiss trauma center study evaluating the differences between survivors of severe trauma (Injury Severity Score, ISS > 15) with regard to whether they sustained mTBI (Abbreviated Injury Scale, AIS head > 1) or not (non-mTBI). Comparison of patient, injury and treatment characteristics as well as long-term outcome scoring (SF-36, EQ-5D, TOP, QOLIBRI) at least one year following trauma (ANOVA; p < 0.05).

Results: Overall 154 severely injured patients returned the self-report questionnaires: n = 81 following mTBI vs. n = 73 non-mTBI. Groups did not differ with regard to age, gender or mean ISS. In contrast, mTBI-patients were less often victims of high energy trauma (p = 0.006), more often admitted secondary from another hospital (p = 0.012) and had a higher probability to die (RISC < 0.001). mTBI patients more frequently sustained severe injury (AIS > 2) of the face (p = 0.001) vs. non-mTBI who more often sustained additional severe injury of the thorax, abdomen, extremities and pelvis (all p < 0.001). mTBI patients more often underwent emergency operations (< 6h after admittance; p = 0.008) or an ICU treatment (p = 0.049), but did not differ in functional outcome at the end of hospital stay (Glasgow Outcome Scale). With regard to long-term outcome, e.g. the SF-36 or EQ-5D both groups demonstrated reduced values compared to the norm, but did not differ from each other. The trauma specific TOP only revealed a lower function for mTBI vs. non-mTBI patients in the mental item (p = 0.001), the brain specific QOLIBRI in the cognition item of mTBI (p = 0.015). No differences were found between the rate of capacity to work, loss of income or invalidity at least one year following injury.

Conclusion: Surprisingly, both trauma energy and injury severity (ISS) were not higher in mTBI compared to non-mTBI patients. The long-term outcome of severely injured patients with mTBI appeared to differ only very discreet from those without mTBI. Further studies have to evaluate whether this finding may be due to an insufficient sensitivity of scorings well established in the field or may disclose a higher than expected functional loss of patients without mTBI.

Is the Berlin definition less rater reliant?

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Objective: The Berlin Definition arose as the consequence of different discussions through a consensus process. Severely injured patients should be better selected by adding defined physiological parameters to the AIS, than solely using the AIS-based classification. The aim of this study was to investigate the rater dependence of the trauma scores (ISS, AIS, NISS and TRISS) as well as of the ISS based polytrauma definitions towards the Berlin Definition.

Methods: For the analysis of the interobserver reliability of the trauma scores, a total of 319 patients who met the inclusion criteria of the TraumaregisterDGI® 2009 and who were coded by different doctors, were included. For each patient, we, retroactively, estimated the ISS, TRISS, NISS and AIS of the different body regions. Here the statistical measure of the interobserver reliability was an Intra-Class-Correlation (ICC, two-way mixed, single measure, absolute agreement and confidence interval of 95%). For the analysis of the interobserver reliability of the polytrauma definitions, the sample was reduced to 187 primarily allocated patients. By different AIS and ISS coding the patients were defined as polytraumatized patients. Thereby we can describe the polytraumatized patients within the varying polytrauma definitions: ISS > 16, ISS > 18, ISS > 20 and the Berlin Definition. The statistical measure of the interobserver reliability was Cohen's coefficient, Kappa.

Results: The statistical analysis of the interrater reliability, in view of the trauma scores, evidences good accordance (p < 0.001) determining the ISS, NISS, AIS Abdomen and TRISS. Only the AIS External shows questionable accordance (p = 0.60), whereas the rest of the AIS groups match excellently (p < 0.01). The statistical analysis of the interrater reliability of the polytrauma definitions presents moderate accordance (p < 0.001) in the ISS groups (ISS > 16, ISS > 18 and ISS > 20). The Berlin Classification shows complete accordance (p < 0.01).

Conclusion: Compared to the ISS based polytrauma definitions, the Berlin Definition seems to be less rater reliant. Our investigation underlines the current discussions of the need to redefine the term polytrauma especially in regard to its rater dependence. By doing this, a better comparability of the patient data in studies and quality assurance procedures can be guaranteed.

Perioperative visual loss (POVL) in trauma patients without head injury: A report of two cases A case of ???

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Objective: POVL without head trauma is rare, unexpected and a devastating complication. It is mostly associated with anterior ischemic optic neuropathy (AION), and much rarer with cortical blindness. In 2015 we observed two cases in our clinic.

Methods: Patient A sustained in a high-speed car accident a periprosthetic femur fracture but no head injury. The osteosynthesis was done in a hemodynamically stable patient followed with a mild hypotensive period on the ICU due to intra-and postoperative blood loss. Low Hb level (62 g/L) was corrected with 6 RCCs (red cell concentrate) in the first three days. Patient B fell 10 meters from a roof. He was hemodynamically unstable on arrival. Multiple fractures including a lumbopelvic dissociation were diagnosed. After damage control surgery including a pelvic C-clamp, definitive lumbopevic stabilisation was started on day 1 under stable conditions and normal organ function. A massive intraoperative blood loss lead to a prolonged shock state requiring mass-transfusions (28 RCCs).

Results: Patient A showed a fast prograding vision loss on day 2. CT and MRI (head, neck) were normal as well as fundoscopy. The diagnosis of an AION was made at MRI (head, neck) was normal as well as fundoscopy. The diagnosis of an AION was made and steroids were given, but unfortunately without improvement of vision after nine months. Patient B was awake after exubation but there was a major discordance between the patients subjective vision and the objective examination. The patient denied his visual loss and confabulated, which is known as Anton Syndrome. A cortical blindness was suspected, which could be confirmed by MRI. Both patients were middle aged (50, 67), male, with major traumatic blood loss and periods of moderate hypotension with relative slow response to treatment.

Conclusion: POVL is a rare complication and mainly seen after planned spine and cardiac surgeries. Identified risk factors include male sex, longer
anaesthetic duration, greater estimated blood loss, and decreased percent colloid administration. POVL is often permanent and untreatable, so prevention is the key to limit its impact. We could not find this complication in the current trauma literature. We believe that teaching for early recognition and aggressive management of haemorrhagic shock in trauma patients is a very important and ongoing task and has to be continued.

Treatment of abdominal trauma from the trauma surgeon's point of view–results of an online survey

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Objective: The classic general surgery and trauma surgery in Germany, Austria and Switzerland has undergone notable changes during the last years. Curricula and treatment situation are different within all three countries. Whereas the general surgery dissolved into visceral surgery in Germany, the trauma surgery abandoned thoracic and abdominal interventions to a varying extent. We therefore aimed to obtain the current treatment situation to identify structural adaptations that need to be made. 

Methods: A cross-sectional study, based on an online survey, including 175 Austrian, Swiss and German trauma surgeons, was carried out over a period of 3 months in 2015. With regard to structural variables were assorted due to their inclusion probability in the consequent models. Depending on the 13 variables, 14 possible triage models were evaluated. Brier-and Log-scores were calculated to evaluate how good the model manages to predict the necessity of resuscitation room activation. Within the chosen model we calculated the resulting rate of over- and under-triage.

Results: A total data of 1917 patients were included in this study. 69% (n = 1344) were allocated to the emergency department; 31% (n = 593) treated in the resuscitation room. Mean age of all patients was 48 ± 22 years; sex distribution was 62% male and 38% females. Mean ISS was 7 ± 9 points. A mortality of 4% (n = 71) was measured. Best prediction values were achieved with 11 variables, but the performance of the model did not decrease significantly by reducing to 7. Within the patients taken to ward or ICU there were 8.5% (n = 19) of under-triage and 22.5% (n = 385) of over-triage. Strictly using the prediction model with 7 covariates the under-triage would change to 2.8%, whereas in its turn we were forced to accept an over-triage of 56.6 %.

Conclusion: Within this study the resuscitation room activation criteria could be reduced to 7 without losing its accuracy and safety for the patient. Statistical irrelevant parameters like pre-hospital estimated ISS, an intubated patient and suspected fractures of two proximal long bones could be excluded as well as a summarization of the accident pattern. Based on our findings the criteria should be validated and further evaluated with respect to potential independent factors e.g. age.

Research

Contact between platelets and liver sinusoidal endothelial cells leads to the release of cytokines and growth factors crucial for liver regeneration

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Objective: Platelets and liver sinusoidal endothelial cells (LSEC) were shown to be important contributors to liver regeneration. The aim of our study was to investigate the effect of platelets and LSEC interactions in vitro and after partial hepectomy in mice.

Methods: Primary mouse LSEC were isolated with our newly developed method consisting in collagenase digestion followed by 4.27% centrifugation and CD11b-negative magnetic sorting. 100'000 LSEC were incubated without or with 0.16 to 16 million platelets for 24 hours. Platelets were either resting or activated with thrombin or ADP. Secretions of IL-6, IFN-γ, EGF HGF, VEGF and TGF-β were measured by ELISA. To analyze platelet and LSEC interactions in vivo, mice were injected with labelled anti-CD49b (platelets) and anti-CD146 (LSEC) antibodies and analyzed by intravital confocal microscopy. Platelet adherence to LSEC was quantified after 15 minutes in sham-operated and partial hepectomized mice.

Results: We obtained high yields of 96.00 ± 6.96% pure primary LSEC. When LSEC were incubated with increasing numbers of resting platelets (LSEC:platelet ratio from 1:1 to 1:160), IL-6 secretion increased from 3.46 to 77.66 [pg/ml]; p < 0.05, for LSEC alone = 1.88 [pg/ml], platelets alone = 0 [pg/ml]. When LSEC were co-incubated with thrombin-or ADP-activated platelets, secretion of IL-6 was further increased (for thrombin: 7.04 to 88.69 [pg/ml]; for ADP: 16.72 to 311.5 [pg/ml]; p < 0.05). IFN-γ and EGF were released by platelets or LSEC, but independently of contact. We did not detect any HGF, VEGF or TGF-β secretion. After partial hepectomy, adhesion of platelets to LSEC was significantly increased compared to sham-operated mice (adherence: 56.31% versus 29.69%; p < 0.05), confirming platelet adhesion to LSEC to occur in vivo.
Conclusion: Platelets induce IL-6 release by LSEC, and this secretion is dependent on platelet concentration and activation. After partial hepatectomy, platelet adhere to LSEC. These results suggest that platelets trigger early changes on LSEC relevant for liver regeneration.

Targeting the hypoxic tumor compartment improves anti-cancer efficacy of mTOR inhibitors

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Objective: Inhibition of the mechanistic target of rapamycin complex 1 (mTORC1) by chemical inhibitors, like rapamycin, has demonstrated anti-cancer activity in preclinical and clinical trials. However, this efficacy is limited and tumors eventually relapse through resistance formation. Identification of resistances is important in order to improve efficacy of targeted therapies. In this study, influence of tumor hypoxia on the anti-cancer efficacy of mTOR inhibitors was investigated.

Methods: Samples of human tumor xenografts and mouse tumor allografts were assessed for mTORC1 activity and hypoxia using pS6 and pimonidazole staining respectively. Cancer cell proliferation was evaluated using PCNA staining. Inhibition of carbonic anhydrase IX (CAIX), a mediator of the hypoxia-induced response in cancer cells, in combination with mTOR inhibitors was tested in two different mouse models of cancer.

Results: Activity of mTORC1 was restricted to the non-hypoxic tumor compartment. Consequently, whereas rapamycin reduced cancer cell proliferation in non-hypoxic regions (13% proliferation inhibition, p < 0.0001), it had no effect in hypoxic areas (0% proliferation inhibition, p = 0.878), suggesting that cancer cells proliferate independently of mTORC1 under hypoxia. Targeting the hypoxic tumor compartment by ablation of carbonic anhydrase IX (CAIX) using short hairpin RNA or by chemical inhibition of CAIX with acetazolamide potentiated the anti-cancer activity of rapamycin (65% growth inhibition with rapamycin alone / 94% growth inhibition with rapamycin combined with acetazolamide, p = 0.0001).

Conclusion: These findings emphasize that the hypoxic tumor compartment provides a novel treatment strategy in HCC.

Combining telomerase inhibitors with sorafenib as a treatment strategy in advanced hepatocellular carcinoma

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Objective: Despite the development of new therapies, such as the tyrosine kinase inhibitor sorafenib, no curative treatment exists for patients with advanced hepatocellular carcinoma (HCC). Thus, the development of new therapeutic strategies is necessary to improve the outcome of these patients. Here, we tested the anti-cancer efficacy of sorafenib in combination with telomerase inhibitors, an enzyme whose activation is detected in up to 60% of HCC.

Methods: Human hepatocellular carcinoma cell lines (HepG2, HuH-7, and PLC-PRF 5) were treated with sorafenib in combination with telomerase inhibitors (BIBR-2, Costunolide and MST 312). In vitro, cell proliferation was determined using an MTS proliferation assay and a BrdU incorporation assay, cell cycle analysis was determined by flow cytometry and cell death by apoptosis assay. In vivo, the growth of human HCC xenografts was monitored in nude mice either left untreated or treated with sorafenib, costunolide, or sorafenib in combination with costunolide.

Results: Treatment of HCC cell lines with sorafenib resulted in a significant reduction of cell proliferation and increase of cell death. This effect was more effective when sorafenib was combined to a telomerase inhibitor (BIBR-2, costunolide and MST 312). Cells growth was reduced in MTS assay by 42.1%, 48% and 79% for HepG2/C3a, HUH-7 and PLC-PRF5 respectively (p < 0.05) and proliferation in BrdU incorporation assay by 42%, 44% and 47% respectively (p < 0.05). In cell cycle analysis, combined therapy resulted in a more prominent sub-G1 population compared to sorafenib alone (88% vs 38%, p < 0.05).

Conclusion: These findings demonstrate that combining telomerase inhibitors with sorafenib displays greater anti-cancer benefit than sorafenib alone and thus provides a novel treatment strategy in HCC.

ALPPS does not promote colorectal tumor growth in a rodent model

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Objective: ALPPS induces an unprecedented liver hypertrophy and enables resection of primarily unresectable liver tumors. However, the effect of ALPPS on tumor proliferation remains a concern. The aim of this study was to investigate the impact of ALPPS (Associating Liver Partition with Portal vein ligation for Staged Hepatectomy) on growth of colorectal metastases in mice.
Methods: The effect of ALPPS and 90% portal vein ligation (PVL) on colorectal liver and lung metastases was investigated in mice. In vivo tumor progression was assessed by magnetic resonance imaging (MRI), histology and survival experiments. The effect of ALPPS, PVL and control sera on colorectal cancer cell-lines (MC38 and CT26) was subsequently tested in vitro. Additionally, to test the laboratory findings, the international ALPPS registry enabled to identify patients, in which tumor was left in the future liver remnant (FLR) after stage 1. The progression of the tumor growth was assessed in this subset of patients.

Results: Two and three weeks after ALPPS stage 1, PVL or sham surgery, similar intrahepatic tumor numbers (p = 0.56/0.53), sizes (p = 0.45/0.98) and growth kinetics (p = 0.58/0.68) were observed using MRL. Completion of hepatectomy in ALPPS and PVL group resulted in similar findings at both time points. Median survival after tumor cell injection was not different between sham surgery and completion of ALPPS and PVL (36 days (IQR 32–40) vs. 42 days (IQR 36–48) vs. 39 days (IQR 35–42), p = 0.237). Pulmonary metastases progression and in vitro cell proliferation were similar among groups. Observations in humans failed to identify accelerated tumor growth in the FLR within the regenerative phase after stage 1.

Conclusion: Contrarily to some beliefs, the ALPPS procedure seems not to influence colorectal tumor growth.

Verteporfin inhibits hepatocellular carcinoma growth in vitro and in vivo
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Objective: Hepatocellular carcinoma (HCC) is one of the most common malignant tumors worldwide. Angiogenesis and the Hippo signaling pathway (hpo) play an important role in the development and progression of HCC. Verteporfin (VP), a photosensitizer, is able to disrupt the hpo YAP/TEAD transcriptional complex activity. Here we study the effect of VP in vitro and in vivo in HCC without prior light activation, focusing particularly on the mode of action of VP.

Methods: VP was able to impair HCC proliferation (HepG2, Hep3B, Huh7) in a time-dose-dependent manner, as observed by cell viability and clonogenic assays (p-value < 0.0001). VP significantly down-regulated the mRNA expression of proliferative/YAP target genes and differentiation genes (p-value < 0.001), interfering with cell-cycle progression and enhancing apoptosis (p-value < 0.001), as assessed by q-PCR and flow cytometry. VP treatment reduced the proliferation and the tube formation capabilities (p-value < 0.001) of immortalized microvascular endothelial cell (HMEC-1).

Results: Subcutaneous HCC cell line xenografts in Rag2−/−γc−/− mice showed significantly reduced tumor growth (p-value < 0.0001) after fourteen days of VP treatment. There was a marked decrease of Ki67 positive cells within the tumor tissue (p-value < 0.0001) and also a statistically significant down-regulation of proliferative/YAP target genes expression (p-value < 0.0001). VP-treated mice showed a significant decrease of CD31+ cells within the tissue (p-value < 0.0001) as well as a significant down-regulation of VEGF-A and mRNA levels (p-value < 0.0001). While previous authors suggest the mechanism of action of VP as the result of a direct binding of VP to the YAP/TEAD complex, our results show, that VP interferes with the autophagic flux, co-localizing into the lysosomes, with VP acting as an early stage autophagy inhibitor.

Conclusion: Treatment of HCC remains challenging, especially in patients suffering from advanced liver disease. Our results suggest that the antitumor activity of VP in HCC models is due to an inhibition of tumor angiogenesis as well as due to a direct effect on tumor cell proliferation and progression. This does not occur as previously suggested by direct interaction with the YAP/TEAD complex but by means of interfering with the autophagy machinery. Verteporfin may be a promising drug in the treatment of otherwise inoperable, advance HCC.

Vascular Surgery

Development of a risk prediction model for transfusion in carotid endarterectomy and demonstration of cost-saving potential by avoidance of “type and screen”
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Objective: Preoperative testing for carotid endarterectomy (CEA) often includes blood typing and antibody screen (T&S). In our institutional experience, however, transfusion for CEA is rare. We assessed transfusion rate and risk factors in a national clinical database to identify a cohort of patients in whom T&S can safely be avoided with the potential for substantial cost savings.

Methods: Using the NSQIP database, transfusion events and timing were included for all elective CEs in 2012–13. Comorbidities and other characteristics were compared for patients receiving intra- or postoperative transfusion and those that did not. Using one half of the data set, a point-based risk prediction model was developed which was subsequently validated on the other half.
**Results:** Of 16,045 patients undergoing CEA in 2012–13, 276 received at least one transposition prior to discharge (1.7%). 42% of transpositions occurred on the day of surgery. Patients receiving a transposition had worse clinical 30-day outcomes: stroke (6% vs. 1% for control group, P < 0.001); myocardial infarction (8% vs. 1%, P < 0.001); mortality (6% vs. 0.6%, P < 0.001) (Fig.1). Preoperative hematocrit <50% (Odds ratio: OR: 57.4; 95% confidence interval CI: 29.6-111.1), dependent functional status (OR: 2.7; 95% CI: 1.3-5.1), coagulopathy (OR: 2.5; 95% CI: 1.7-3.6) and creatinine ≥1.2 mg/dl (OR: 2.3; 95% CI: 1.6-3.3) among other risk factors predicted transposition (Fig.2). A risk prediction model based on these data produced a C-statistic of 0.886; application of this model to the validation set demonstrated a C-statistic of 0.857. 97% of patients in the validation set received a score of 4 or less corresponding to an individual predicted transposition risk of 5% (Fig.3). Omitting a T&S in these patients would generate a potential annual cost saving for NSQIP hospitals of over $5,400,000 based on our institutional cost.

**Conclusion:** While T&S is commonly performed for patients undergoing CEA, transposition following CEA is rare and well predicted by a transfusion risk score. Avoidance of T&S in this low-risk population provides a substantial cost-saving opportunity without compromise of patient care.

**Use of the STAT (Sutureless Telescopying Anastomosis Technique) to facilitate supraaortic revascularization: Mid-term Results:**

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**Objective:** We report the mid-term results of use of a sutureless telescoping anastomosis technique (STAT), the modification of technique initially described as VORTEC, for revascularization of supra-aortic vessels.

**Methods:** Between January 2009 and December 2004, 55 patients (37 males) with an aortic arch lesion underwent trans-sternal debranching with sutureless telescopying anastomosis. The underlying aortic pathologies were: isolated aortic arch aneurysm (10 patients), aortic arch aneurysm extending to ascending or descending aorta (26), subclavian artery aneurysm (3), traumatic aortic rupture (1), aortic dissection (10), and other arch pathologies as aortic ulcer of floating thrombus (5). Follow-up included computed tomography angiography at 1, 3, and 6 months postoperatively, and then annually.

**Results:** Overall, 148 supra-aortic vessels in the 55 patients were revascularized. 127 by STAT and 21 by sutured surgical anastomosis. Immediate technical success was 100%. There was no early graft occlusion and late graft occlusion was detected in two patients. Perioperative mortality was 7.3% (one postoperative bleeding, one retrograde dissection, one MOF (multi-organ failure) and one cerebral bleeding). Mean follow-up (FU) at June 2015 was 45.12 months: 45 patients with FU more than 2 years, 36 more than 5 years and 23 more than 4 years. Patients' cumulative survival at 4 years was 84%. There were no difference in patency rate between STAT and sutured anastomosis.

**Conclusion:** Sutureless telescopying anastomosis technique (STAT) reduces technical difficulties and invasiveness of aortic surgery (reduces ischemia time, no clamping or circumferential dissection). This technique allows performing anastomosis where sutured anastomosis is challenging (dissection, intramural hematoma). Mid-term results confirm that sutureless anastomosis is safe and reliable alternative to sutured one.

**Modern fixed imaging systems reduce radiation exposure to patients and providers**

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**Objective:** Endovascular therapy for aortic and peripheral interventional is increasingly becoming the first line treatment modality for a wide array of disease processes. High definition fluoroscopic imaging is required to perform these procedures, which are furthermore growing in complexity resulting in high radiation exposure to patient and providers. This is of particular importance for training institutions as residents and fellows despite instruction in ALARA principles tend to have high radiation exposures. Recently, there was an upgrade of the fixed imaging system at our institution. We used this opportunity to compare radiation exposure to patients and providers before and after the upgrade.

**Methods:** We performed a retrospective analysis of consecutive EVAR and SFA interventions at our institution in the years 2013–14 and created two cohorts: pre and post upgrade. We analyzed BMI, fluoroscopy times (FT) and air kerma (AK), and then matched 1:1 based on fluoroscopy times as well as BMI. We also analyzed individual surgeons' badge readings. The fixed imaging system was Allura Xper FD20 and was upgraded to Allura Clarity FD20 (both Philips Healthcare).

**Results:** We identified a total of 76 EVARs (53 pre, 23 post) and 123 SFA interventions (99, 24) yielding cohorts of 23 patients each for EVAR analysis and of 24 patients each for SFA analysis. Complete data are shown in table 1. There was a 52% reduction in AK for EVAR and 72% for SFA interventions, respectively (p < 0.001 for both). 5/6 surgeons experienced a reduction in their average monthly badge readings after system upgrade (Figure 1), most notably the fellow from 512 to 109 mrem (p = 0.0032).

**Conclusion:** Aortic and peripheral endovascular interventions can be performed with reduced radiation exposure to patients and providers employing modern fixed imaging systems. This is of particular importance in light of more complex procedures such as fenestrated and branched endografting that will require substantial fluoroscopy to perform.

**Treatment effect of preemptive embolization of the inferior mesenteric artery prior to endovascular aortic repair**

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**Objective:** The early postoperative benefits after endovascular aneurysm repair (EVAR) need to be balanced against late complications and re-intervention rates. The role of type II endoleaks (EL) and their treatment remains unclear. The aim of this study is to report the treatment effect of preemptive embolization of the inferior mesenteric artery (IMA) prior to EVAR.

**Methods:** We analysed all patients treated with elective EVAR between January 2001 and December 2012. Size and patency of the IMA were assessed from the latest preoperative CT-angiography. Preemptive embolization had been performed if the IMA-diameter was ≥3mm. To maximize comparability between patients' measurements, we linearly interpolated diameters in time to obtain two-year endpoints for patients not having CT-scans at 24±1 month. Study endpoints included aneurysm diameter change after 24 months, type II EL and re-interventions as well as overall survival. Follow-up controls were performed with CT angiography at 1 month, 6 months, 12 months and annually thereafter.

**Results:** During this period 251 patients underwent EVAR for abdominal aortic aneurysm. 42 patients with preoperatively occluded IMA were excluded. Of those with patent IMA, 46/209 (22%) underwent preemptive IMA embolization. Mean follow-up time was 6.2 years (range 1.5-13.4). At baseline as well after 24 months, there was no significant difference regarding aneurysm diameter between the embolized and the non-embolized group, (56.9±8.9 mm vs. 56.6±9.8 mm, p = 0.88 and 52.6±17.2 mm vs. 50.8±17.7 mm, p = 0.35 respectively). Type II EL due to patent IMA was higher in the non-embolized 16/163 (22%) vs. 1/6 (2%) in the embolized group (p = 0.001). Three (1.8%) late embolizations of the IMA were needed because of aneurysm sac progression in the non-embolized group and no re-intervention was needed in the embolized group. No difference in mortality rate was detected at any time between both groups (0.6% vs. 0.5%, p = 0.594 after 30-days; 5.3% vs. 4.3%, p = 0.733 after 1 year, 16.8% vs. 11.6%, p = 0.425 after 3 years and 38.3% vs. 23.3%, p = 0.116 after 5 years follow-up, respectively).

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Conclusion: At mid-term follow-up preemptive coiling of the IMA prior to EVAR lead to less type II endoleaks, however, no impact on aneurysm diameter change was observed. Similar re-intervention and mortality rates were recorded.

Incidence of hospitalisation for abdominal aortic aneurysm and type of repair in Switzerland from 2002 to 2014

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Objective: Abdominal Aortic Aneurysm (AAA) prevalence and treatment epidemiology could have change recently due to population aging, prevention program and Endovascular Aortic Repair (EVAR).

Aim of this study was to assess the evolution of hospitalisation rate for AAA and surgery type in Switzerland during the last thirteen years.

Methods: Retrospective analysis of data from the Federal Statistical Office. Since 2002 more than 99% of all medical institution with stationary care include their data.

Data collected included age groups (40–69 and > 70 years), type of presentation (ruptured or non ruptured AAA) and treatment modality (open repair or endovascular).

Results: The rate of hospitalisation for AAA per 100'000 inhabitant increased from 14.8 in 2002 to 16.7 in 2005 (p < 0.05) mostly due to non ruptured aneurysm increase from 11.7 to 13.4 (p < 0.05). Thereafter both rates per 100000 habitants remained stable until 2014 with rates of 17.1 and 13.3 for total and unruptured AAA. Ruptured AAA rate didn’t change significantly all along the study period median rate of 3.5 (IQ 3.2-3.7) Once corrected for age and type of presentation there was no significant difference in incidence during the study period (p = 1).

The number of intervention is growing steadily from 6 to 11.8 repairs per 100000 inhabitant in 2002 and 2014 respectively (p < 0.001). The rate of open surgery remained stable during the study period with a median of 10.4 (IQ 9.4-11.7) while endovascular did show a rapid increase from 0.7 to over 6/100000 inhabitant for the last three years (p < 0.001). The rate of open surgery within both groups stayed stable but there was a fivefold and over tenfold increase in endovascular treatment the 40–69 years and >70 years old groups respectively.

Conclusion: Abdominal aortic aneurysmal disease incidence seems to be stable for the last ten years but the rate of intervention is increasing with time especially in the elderly population using minimal invasive procedure.

Early multicentric experience with the Nellix endovascular aneurysm sealing system for abdominal aortic aneurysm repair

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Objective: Despite increase in operator’s experience and technology in EVAR devices, the long-term durability remains problematic with 20% of re-interventions, especially due to endoleak (EL). In this context, the endovascular aneurysm sealing (EVAS) is an innovative concept, based on the deployment of polymer-filled EndoRags surrounding the Nellix endografts (Endologix, Irvine, California) and filling the aneurysmal sac. The aim of this study was to report our early multicentric experience.

Methods: Retrospective analysis of prospective data retrieved from 3 centers between December 2013 and January 2016 was done. All patients with the Nellix system implanted within the IFU were analyzed. Endpoints were technical success, postoperative morbidity, rate of endoleak and any aneurysm-related re-interventions during follow-up.

Results: In this study, 49 patients (mean age 77 years, range 52–89) were identified. Except one case, all of the patients were ASA score 3 or 4. The 44 male and 5 female patients had aneurysms of 57.5 mm (range 42–85) in diameter with an average infrarenal aortic neck length of 27 mm (range, 10–55) and diameter of 25.0 mm (range, 18–32). Operative time was 106 minutes (range, 58–210) with a procedural success achieved in all cases. A percutaneous approach was done in 70% of cases. The mean length of the Nellix stents implanted was 152 mm (range, 110–180) and the mean volume of polymer was 79 ml (range, 18–360). The mean volume of contrast reached 101ml (range, 30–250). In the post-operative period, 3 complications occurred, 1 myocardial infarction, 1 pulmonary infection and 1 wound dehiscence requiring a surgical revision. The mean follow-up was 8.5 months (range, 1–24). At the CT scan of control, all stents were patent and no type I/III EL were observed. Two aneurysm-related reinterventions were observed at 13 and 15 months for a type I EL and a limb occlusion, requiring EL embolization and a fem-fem bypass. There were 3 deaths unrelated to the aneurysm at 5, 7 and 15 months respectively.

Conclusion: The EVAS concept using the Nellix system appears to be safe and provides excellent results during this early learning phase. High rate of aneurysm sealing was achieved with rare complications. It could be a valid alternative to standard EVAR but larger trials and registries are needed to draw definitive conclusions.

Morphologic predisposition in thoracic outlet syndrome—evaluation of 293 operative reports

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Objective: The Thoracic Outlet Syndrome (TOS) is a controversially disputed neurovascular compression syndrome. Diagnosis can be difficult due to missing generally accepted clinical and imaging criteria. As we have demonstrated in a recent survey, supraclavicular first rib resection can yield over 90% good to very good long term results (mean follow-up 10 years) in selected patients. The aim of the present study was to evaluate all operative reports of TOS-patients, especially what concerns underlying anatomic variants and then comparing the results to the available literature.

Methods: Retrospective analysis of 291 operative reports of 260 TOS-patients (11% bilateral) operated on by one single surgeon between 1990 and 2015.

Results: Mean age at operation was 49 years (9–68), 64% of patients were female. 14 patients presented a purely vascular TOS (2% arterial, 3% venous). In the reports a total of 459 anatomic particularities have been described. In 95% of cases at least one anatomic anomaly has been stated; in 62% two or more relevant anatomic variants have been detected. In 63% aberrations of the scalene muscles and in 55% ligamentary structures causing the neurovascular irritation have been identified. In 32% there were modifications of bony structures, as slight alterations in position and morphology of the first thoracic rib (21%), in 11% cervical ribs have been mentioned.

Conclusion: According to literature anatomic variants of the thoracic outlet are not uncommon (39-50%); in 1/3 of cases more than one anomaly has been described. However, in our TOS-patient’s collective, 91% show at least one, 62% two or a combination of several relevant structural particularities. Prevalence of cervical ribs in patients with TOS is up to 10 times higher when compared to the general population (<1%), what has been confirmed by our data. However, according to our results even more important is the morphology and position of the first thoracic rib. In addition, our results demonstrate that irritating structures are in most cases soft tissue anomalies, as scalene muscle aberrations and ligaments, which may not be easily detected by conventional preoperative imaging.

Implementation of a detailed vascular access register to improve the clinical management of haemodialysis patients

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Objective: Vascular access (VA) is of paramount importance for haemodialysis patients. Central venous catheter (CVC) use is associated with increased risk of morbidity and mortality. International guidelines recommend starting
Endovascular treatment of below-the-knee lesions in patients with critical limb ischemia is the procedure of choice

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Objective: Endovascular treatment is nowadays the treatment of choice for critical limb ischemia (CLI) especially at the below-the-knee (BTK) level due to improvements in technology and low rate of morbi-mortality. However, some controversies still exist regarding the long-term results and the material of choice. The aim of this study is to report our monocentric experience of BTK treatment.

Methods: Retrospective analysis of prospective data retrieved from 1 center between January 2013 and December 2013 was done. All consecutive patients with endovascular treatment of BTK lesions for CLI were included. Endpoints were technical success, postoperative morbidity, mortality, and any aneurysm-related re-interventions during follow-up.

Results: In this study, 14 patients (mean age 73 years, range 60–87) were included. Technical success rate reached 91% (13/14) of cases with one failure of celiac trunk (CT) cannulation. A total of 48 target vessels have been stented (28 renal arteries, 12 SMA and 8 CT). Access vessels were the left axillary artery in 10 cases and the left brachial in one. Two intra-operative complications occurred (1 iliac rupture and 1 splenic hemorrhage). In the post-operative period, 1 patient died (7%) due to rupture of the TAAA between the 2 steps of the interventions. Five complications requiring 3 re-interventions occurred in 3 patients: 1 renal failure, 1 limb ischemia, 1 transient paraplegia, 1 colic ischemia and 1 serumoma. During mean follow-up of 16 months, no type I EL was observed but 1 type III and 5 type II (13/14) of cases with one failure of celiac trunk (CT) cannulation. The post-operative rate of mortality was 3%. Moreover, all aneurysms were degenerative in origin. There were 5 juxta-renal AAAs and 9 TAAAs (1 type IV, 3 type III, 2 type II, 1 type I). Operative time was 341 minutes (range, 240–470). In 8 cases, a branched graft was used and in 6 1 fenestrated one. Cephalo-spondial fluid drainage was done in 10 patients. Procedural success was achieved in 95.1 (13/14) of cases with one failure of celiac trunk (CT) cannulation. The new vascular access register allowed us to spot out the weaknesses of the dialysis clinical pathway for our patients. Timely referral to surgeons and early creation of permanent VA by dedicated teamwork could be some corrective actions to be implemented in order to improve the success rate of AV fistulae decreasing CVC use, so enhancing quality of care for dialysis patients.

Thoracic Surgery

A plea for thoracoscopic resection of indeterminate solitary pulmonary nodules in patients with known malignancy

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Objective: Solitary pulmonary nodules (SPN) of indeterminate etiology are frequently detected in patients with known malignancies and these lesions are increasingly treated by non-surgical techniques (radio-ablation or stereotactic radiotherapy) without histological confirmation. The aim of this study is to determine the nature of thoracoscopically resected SPN in these patients and to establish predictors of malignancy in order to avoid undertreatment (primary lung cancer) and overtreatment (benign lesion).

Methods: Retrospective analysis of all surgically fit patients with known malignancy undergoing VATS resection of indeterminate SPN between 2001 and 2014.
Results: One hundred and forty patients underwent VATS resection of SPN. There were 75 men and 65 women (median age 65 years, range 28–82 years) with the following underlying malignancies: colorectal cancer (n=41), melanoma (n=19), lung cancer (n=17), head and neck cancer (n=14), sarcoma (n=13), breast cancer (n=11), uro-genital cancer (n=11) and others (n=14). The resected SPN was malignant in 106 patients (75.7%) and benign in 34 (24.3%). Malignant SPN were related to metastatic diseases in 70 patients (50%) and to primary lung cancer in 36 patients (25.7%). Univariate analysis revealed a significant association with SPN malignancy and age > 60 years (RR: 2.673; CI 95%: 1.167-6.122; p=0.02), disease-free interval > 24 months (RR:2.898; CI 95%: 1.316-6.41; p=0.009), SPN size >8mm (RR: 5.401; CI 95%: 2.282-12.782; p<0.0001) upper lobe localization (RR: 2.665; CI 95%: 1.203-5.905; p=0.016) and PET hypermetabolism (RR: 7.933; CI 95%: 2.213-28.436; p=0.001).

Conclusion: The majority of SPN in patients with known malignancy were malignant but a substantial number of cases were benign. In addition, only two thirds of malignant SPN were related to the underlying malignancy whereas one third were new primary lung cancers. These results endorse the need of histological confirmation of SPN in these patients in order to avoid inappropriate diagnostic uncertainty and suboptimal treatments.

Near-infrared fluorescence is useful for identification of the intersegmental plane in thoracoscopic lung segmentectomy

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Objective: Evaluation of fluorescence imaging during lung segmentectomy by Video-Assisted Thoracic Surgery (VATS)

Methods: Study of VATS segmentectomies assisted by fluorescence imaging (PINPOINT® Novadaq, Canada) in the University Hospitals of Geneva from November 2014 to August 2015. Analysis of technical input, pathological findings, postoperative course and TNM/pTNM correlation.

Results: Intersegmental plane indetermination was perfect in all 17 consecutive segmentectomies, providing additional assistance in case of difficulty with anatomical vascular segmentation. Due to fluorescence imaging, an additional arterial or parenchyma section was performed in two patients (12%). One patient was converted to lobectomy by thoracotomy because of oncological reasons. The postoperative course was uneventful except in 1 patient who developed pneumonia and prolonged air leak (10 days). The drain was removed on POD1 or POD2 in 16 patients with a mean hospital stay of 4.9 +/-2.3 days. Resections were complete for 4 benign lesions and 11 lung cancers.

Conclusion: Fluorescence imaging provides a technical assistance for intersegmental plane identification in VATS, and facilitates vascular identification. It contributes to the quality of diagnostic and therapeutic excisions of small nodules which are often not visible and not palpable during VATS.

Pharmacological inhibition of poly(ADP-ribose)polymerase (PARP) during experimental ex-vivo lung perfusion (EVL) reduces ischemia-reperfusion injury and improves function of transplanted lung grafts

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Objective: Ischemia-reperfusion injury (IRI) is a key mechanism of graft damage during lung transplantation, which could be targeted by therapies applied during ex-vivo lung perfusion (EVL). Production of oxidants and activation of the enzyme poly(ADP-ribose)polymerase (PARP) are key processes involved in IRI. Previously, the pharmacological inhibition of PARP during EVLP was shown to alleviate reperfusion injury and improve graft function ex-vivo. Here, we hypothesized that inhibition of PARP with 3-aminobenzamide (3AB) during EVLP improves lung graft function and reduces IRI in a rodent lung transplantation model.

Methods: Male Sprague–Dawley rats (n=12) underwent left single lung transplantation. Donor lungs were procured from male Sprague–Dawley rats (3 groups, n=4 each): lungs of group 1 were flushed with cold Perfadex following cardiac arrest and stored for 4 hrs at 4°C before transplantation, donor lungs of group 2 and 3 underwent 1hr warm ischemia following cardiac arrest, cold Perfadex flush, and were stored for 1 hr at 4°C, followed by 3 hrs of normothermic EVLP either with Steen solution (group 2) or with Steen solution supplemented with 3AB (group 3). Graft function after transplantation was assessed during 2 hrs with independent ventilation of the graft and the native lung, including assessment of dynamic compliance of the graft. At 2 hours bronchoalveolar lavage (BAL) was performed to measure lactate dehydrogenase (LDH), total protein, and cytokine levels.

Results: 3AB-treated grafts showed significantly increased dynamic compliance up to 2 hours after transplantation compared to all other lungs. 3AB-treated grafts revealed reduced IRI with significantly lower protein, LDH, CINC-1, TNF-α and IL-6 levels in BAL as compared to lungs undergoing warm ischemia but no PARP inhibition.

Conclusion: Pharmacological intervention during EVLP inhibiting PARP protects damaged lungs from ischemia-reperfusion injury after transplantation and improves post-transplant graft function in this experimental setting.

Suppression of lung cancer in mice by DPP4 inhibitor Vildagliptin

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Objective: Lung cancer is the most prominent cause of death among cancers. In spite of improved treatment in surgery, chemo- and radiation therapy, the five year survival is poor. In our previous works, we found that the activity of dipeptidyl peptidase 4 (DPP4) of lung cancer patients was 4 times higher than normal tissues from same patients (n=38) and we showed anti-tumor properties of the DPP4 inhibitor Vildagliptin against lung metastases of colorectal cancer. Recently it has been shown that the inhibition of DPP4 increases surfactant protein (SP) which triggers activation of macrophages and natural killer (NK) cells. Here, we tested if Vildagliptin regulates lung cancer growth in mice.

Methods: An orthotopic tumor model was employed by sc. injections of mouse lung cancer cell line (Lewis Lung Carcinoma [LLC]) and human lung adenocarcinoma cell line (H460). Tumor growth was evaluated by the weight of tumor mass at 4 weeks. Vildagliptin was given in drinking water of 50mg/kg per day dose. Histological assessment included HE, TUNEL, immunohistochemistry (IHC) of CD31, Ki67, pH3, CD3, CD3, CD4, and F4/80. The expressions of SP and Nkp46 were detected by western blotting. TNF-alpha was measured by ELISA. In vitro, surfactant (Curosurf) was given on macrophage cell line (Raw 267.4) to measure production of TNF-alpha.

Results: Vildagliptin treatment significantly reduced the size of tumor developed by lung cancer cell line injection. Beside tumor weight, there was no difference in HE, TUNEL, and IHCs of CD11, CD3, CD4, CD8, while Vildagliptin treatment decreased Ki67-pH3 ratio and increased the population of F4/80 positive macrophages. The activation marker of macrophage (TNF-alpha) and NK cell marker (Nkp46) were highly expressed in Vildagliptin treated tumors. In vitro, we confirmed significantly enhanced SP expression in lung cancer cell lines by Vildagliptin treatment and TNF-alpha expression in surfacetant treated macrophage cell line.

Conclusion: The Inhibition of DPP4 by Vildagliptin decreased lung cancer growth in models of mouse and human lung cancer cell lines and increased inflammatory macrophages and NK cells within the tumors. The increased expression of SP by Vildagliptin treatment in lung cancer cell lines suggests that surfactant production in lung cancer might activate macrophages to fight against lung cancer.
A new prognostic score for treatment allocation for multimodality therapy for malignant pleural mesothelioma–an update

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Objective: We developed a Multimodality Prognostic Score (MMPS) in our patient cohort receiving induction chemotherapy followed by extrapleural pneumonectomy (EPP) or pleurectomy/decortication (P/D) to facilitate the decision for surgery after induction chemotherapy.

Methods: A 4 variable MMPS was developed including pre-chemotherapy tumor volume (>500ml), progressive disease (PD) after induction chemotherapy (according to modified RECIST criteria), pre-chemotherapy CRP (>30mg/ml) and non-epithelioid histological subtype. Overall survival (OS) was calculated from the first cycle of induction chemotherapy until death, and association with the score was analyzed using Kaplan-Meier curve and log rank test.

Results: Between 1999 and 2015, 253 patients were intended to be treated with induction chemotherapy plus EPP. In 65 undergoing EPP and 20 undergoing pleurectomy/decortication (P/D) all variables of MMPS were available. Median age at diagnosis was 61 years in the EPP group and 65 in the P/D group. Epithelioid type was diagnosed in 81% of the EPP and 95% of the P/D group. IMIG stage III in EPP group was 63% and 65% in the P/D group.

In the EPP cohort patients with score 0 survived significantly longer than patients with score 1 or higher (Figure 1). The median OS for patients of the EPP cohort was 34 months (95% CI, 18–50) for score 0, 15 months (9–21) for score 1, 12 months (6–16) for score 2 and 4 months (3–6) for score 3 and 4. In the P/D group the maximum score reached was 2 in only one patient. All the others had a score of 0 or 1. The median OS for score 1 was 10 months (95% CI: 25–36) and 17 months for score 2, but 70% percent of the cases were censored.

Conclusion: Our Multimodality Prognostic Score considering clinical variables already available before surgery allows identification of mesothelioma patients who would not get any relevant benefit from an intensified therapy. The concept is currently under prospective evaluation.

The impact of preconditioning by Sevoflurane after experimental mouse lung transplantation

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Objective: Sevoflurane has been evaluated as a preconditioning measure for the amelioration of post-transplant injury in various organs; however, the data available seem inconsistent particularly for the lung. We therefore evaluated if preconditioning by sevoflurane could modulate innate and adaptive immune responses and potentially protects from primary graft dysfunction (PGD) or acute rejection (AR) after lung transplantation (Tx).

Methods: Two experimental approaches employing the mouse single lung Tx model with 18 hours of graft cold storage were performed: syngeneic Tx (C57BL/6, Syn-Tx, n = 12) to mimic PGD, and allogeic Tx to mimic AR (BALB/c as donors and C57BL/6 as recipients, Allo-Tx, n = 12). Before lung retrieval, donor animals were ventilated (preconditioned) for 2 hours with sevoflurane (Sevo group) or fentanyl (Control group). We analyzed Syn-Tx grafts on day 1 and Allo-1x grafts on day 3 for histology, immunohistochemistry, oxygenation and cytokines (ELISA).

Results: Syn-Tx showed significantly lower plasma levels of IL-6 (p = 0.01) but higher levels of IL-10 in lung tissue (p = 0.001). Also, relatively lower levels of lactate dehydrogenase (p = 0.35) and monocyte chemoattractant protein-1 (p = 0.26) were found, however, no histologic and oxygenation differences were observed when compared to control.

Conclusion: Sevoflurane preconditioning showed protective effects on lung transplants in PGD and AR. The observed amelioration could be attributed to alternatively activated macrophages. Sevoflurane should therefore be clinically evaluated for the protection of lung transplants.

Preoperative exercise therapy in lung cancer surgery reduces the risk of postoperative pulmonary complications

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Objective: Patients with lung cancer often present poor cardio-respiratory fitness. Although rehabilitation programs have demonstrated beneficial effects in patients with cancer, heart failure and COPD, the impact of preoperative exercise intervention has not been thoroughly examined in lung cancer surgery.

The primary aim was to test the effectiveness of a short-term high-intensity training (HIT) program on the occurrence of major postoperative complications. Secondary aims entailed the impact of HIT on aerobic exercise capacity.

Methods: Randomized controlled trial, single centre

Patients scheduled to undergo lung cancer resection were randomized into usual care or rehabilitation arm (UC and Rehab groups). Preoperative rehabilitation was conducted by physiotherapists and consisted in 2 to 3 high-intensity training (HIT) sessions per week. Postoperative clinical outcome data included 30-day mortality, admission in ICU as well as any postoperative organ dysfunction. Patients in both groups received a bundle of perioperative interventions to minimize the occurrence of postoperative cardio-pulmonary complications (PPCs).

To analyze group differences, the unpaired Student t test or Mann–Whitney U-test was used for continuous variables, and the Pearson test for dichotomous variables. To analyze within-group changes over time, the paired Student t test or Wilcoxon signed-rank test or paired was used.

Results: Over a 3 year period, a total of 189 patients were screened, and 151 were analyzed (N = 77 in UC group and N = 74 in Rehab group). The two groups were comparable regarding baseline patient characteristics and surgical data. The median time delay from the date of enrollment to surgery was 26 days (interquartile 25-75%, 21–33 days).

At least one major postoperative complications occurred in 35% and 51% in the Rehab and UC groups (Odds Ratio [OR], 0.56, 95% confidence interval [CI], 0.29–0.80; P = 0.080). The incidence of PPCs was lower in the Rehab group, compared with the UC group (23.0% vs 43.9%, P = 0.018), with a significant reduction in the occurrence of atelectasis (12.2% vs 36.4%, P < 0.001). Thirty-day mortality and non-pulmonary complications did not differ between the two groups (figure 1 or table 1).

Conclusion: Preparing patients before lung cancer resection with a HIT program contribute to prevent the PPCs with no significant impact on other postoperative complications.