

at a dose of 300 mg/body once per week, with an occasional rest week during EBRT, and at a dose of 1000 mg/m² every 3 weeks after EBRT was completed. For evaluation of efficacy and safety, all patients were examined at regularly scheduled follow-up visits. Medical examinations were performed every month. Contrast-enhanced computed tomography was also performed at pre-treatment, and at 1 month and 6 months after KORTUC-IORT.

Results: All treatments, including KORTUC-IORT, were well tolerated in all patients, with few adverse effects. No severe complications were experienced. The follow-up period for all patients ranged from 5 to 29 months; the 1-year survival rate of them was 67%, and the median survival period was 15 months.

Conclusions: We performed this study based on our experimental data indicating that hydrogen peroxide is a potent radiation sensitizer, and showed that the present formulation can be delivered safely and effectively under the conditions used.

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POSTER

Gradient-based Delineation of the Primary GTV on FLT-PET in Esophageal Cancer and the Influence on Radiotherapy Planning

G. Zhang¹, Y. Yin¹, D.L. Han², J. Lu¹. ¹Shandong Cancer Hospital and Institute, Radiation Oncology Physics, Jinan, China; ²Shandong Cancer Hospital and Institute, Radiation Oncology, Jinan, China

Background: The aim of this study was to validate a gradient-based segmentation method for GTV delineation on FLT-PET in EC through surgical specimen, in comparison with threshold-based approaches and CT. Discuss the influences of gradient-based methods delineate the primary GTV to radiotherapy planning.

Materials and Methods: Ten patients with esophageal carcinoma treated with radical surgery were enrolled and detected by ¹⁸F-FLT PET/CT before operation transferred the images to MIM software. For each patient, four GTVs were defined. GTV-CT was based on CT data alone. GTV-^{GRAD}, GTV-^{L1.4}, GTV-^{L30%max} were automatically segmented on PET images using the gradient-based method, fixed threshold values at 1.4 and 30% of SUV_{max}, respectively. The GTV-^{GRAD}, GTV-^{L1.4}, GTV-^{L30%max} were compared with GTV-CT by overlap index. Lengths of GTVs were recorded as L_{CT}, L_{GRAD}, L_{L1.4}, L_{L30%max}, respectively. The length of surgical specimen was recorded as L_{Path}, and compared with L_{CT}, L_{GRAD}, L_{L1.4}, L_{L30%max}. Next, two radiotherapy plans were designed for each patient based on GTV-^{GRAD} (plan-^{GRAD}) and GTV-CT (plan-CT). The radiation dose was prescribed as 60 Gy in 30 fractions. The dose-volume parameters of target volume and normal tissues, CI and HI of plan-^{GRAD} and plan-CT were compared.

Results: The mean L_{Path} was 6.47±2.7. The mean L_{CT}, L_{GRAD}, L_{L1.4} and L_{L30%max} were 7.17±2.28, 6.22±2.61, 6.23±2.80, 5.95±2.5. The correlation coefficients were 0.862, 0.989, 0.920 and 0.920 when compared with L_{Path}, respectively. The overlap index of GTV-^{GRAD}, GTV-^{L1.4}, GTV-^{L30%max} when compared with GTV-CT were 0.75±0.12, 0.71±0.12, 0.57±0.10. The values for mean lung dose, total-lung volume receiving more than 5, 10, 20, and 30 Gy, mean heart dose and heart volume receiving more than 30 Gy of plan-^{GRAD} were significant lower than plan-CT.

Conclusions: The gradient-based method provided the closest estimation of GTV length. The gradient-based method radiotherapy planning reduced the irradiated volume in the lung, heart and other normal tissues.

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POSTER

Phase I/II Study of Scheduled Interval Transarterial Chemoembolization Followed by Radiation Therapy for the Patients With Hepatocellular Carcinoma

J.I. Yu¹, H.C. Park¹, D.H. Lim¹. ¹Samsung Medical Center, Radiation Oncology, Seoul, Korea

Background: We designed this phase I/II study to evaluate the safety and efficacy of the scheduled interval transarterial chemoembolization (TACE) followed by radiation therapy (RT) in the patients with unresectable hepatocellular carcinoma (HCC).

Materials and Methods: Patients with HCC, not suitable for standard therapies, were enrolled for scheduled interval TACE followed by RT (START). Between February 2008 and December 2009, 84 patients were enrolled. The patients who were enrolled in this study, received TACE on the first day of treatment, and then 3-dimensional conformal RT was delivered after 14 days. If the results of liver function test at simulation day (7th day after TACE) were not good enough, one week delayed RT was planned. The overall time of this whole treatment was taken almost in 4 to 5 weeks. Total RT dose and fractionation size were decided by the irradiated normal liver volume.

Results: In 81 patients (96.4%) were completed the START in planned treatment period. Delayed RT was administered to the other 3 patients because of decreased liver function or performance status after TACE.

Of the 81 patients, complete response (CR) was appeared in 7 patients (8.6%), and 50 patients (61.7%) had a partial response (PR). Although one unexpected death was observed after START because of icteric hepatic failure, the other toxicity was quite tolerable. The median survival was 14.7 months. According to the response of START, there was a significant difference in overall survival rate ($p < 0.0001$).

Conclusions: START showed comparable response and survival. And the toxicity was quite tolerable.

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POSTER

Radiotherapy Prolongs Survival in Locally Advanced, Inoperable Gastric Cancer

M. Valkov¹, S. Asakhin¹, M. Levit¹, O. Vtoraya¹, A. Ruzhnikova², S. Litinskiy³. ¹Northern State Medical University, Radiology and Oncology, Arkhangelsk, Russian Federation; ²Regional Clinical Oncology Hospital, Chemotherapy, Arkhangelsk, Russian Federation; ³Regional Clinical Oncology Hospital, Radiotherapy, Murmansk, Russian Federation

Background: Usually, in locally advanced, inoperable gastric cancer (LAIGC) radiotherapy (RT) is only indicated in cases of progressing malignant obstruction. Considering high risk of local/regional progression and poor survival of these patients, we supposed, that addition of RT to the treatment may be beneficial.

Materials and Methods: From November 1998 to August 2007 external beam conventionally fractionated RT was used for patients with LAIGC after explorative surgery or confirmation of medical inoperability. Initially, two parallel-opposed radiation fields covering primary tumour and lymphatics were applied to total 40 Gy, than boost 20 Gy to initial tumour with 3–5 isocentric fields was delivered. In 4–6 weeks after completing RT, patients were assigned to 2–6 courses preferentially platinum-containing chemotherapy (CT). Historical controls consisted of patients with LAIGC undergone CT during the same period. Overall survival calculated using Kaplan–Meier method with log-rank test was established as primary endpoint, and multivariate analysis using Cox proportional regression was done to analyze factors influencing survival.

Results: Overall 110 patients were assigned to RT/CT and 32 patients received CT only. Groups were well balanced on gender, age, initial T-stage (92% T3–4), ECOG and Charlson score. Exploratory surgery and N+ stage were more frequent in CT group – 69% vs 33% (Pearson 2-sided chi-square test, $p = 0.001$) and 55% vs 26% ($p = 0.006$) respectively. At least 40 Gy, 50 Gy and 60 Gy total dose was delivered to 100%, 77% and 53% patients of RT/CT group respectively. Median survival was 20 (95% confidence interval (CI), 15–24) months and 10 (95% CI 6–15) months respectively, $p = 0.015$. In multivariate analysis, favorable survival was detected in lower T-stage ($p = 0.019$), Charlson score less than 4 ($p = 0.026$) and location of primary tumour in middle third of stomach ($p = 0.039$).

Conclusion: Addition of radiotherapy to the treatment of locally advanced, inoperable gastric cancer seems to be of survival benefit. Considering probable patient selection biases in present trial, prospective, randomized study is warranted.

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POSTER

Chemoradiotherapy for Extrahepatic Bile Duct Cancer With Gross Residual Disease After Surgery

H. Park¹, K. Kim¹, J.Y. Jang², S.H. Kim², S.W. Han³, D.Y. Oh³, S.A. Im³, Y.J. Bang³, E. Chie¹, S.W. Ha¹. ¹Seoul National University Hospital, Radiation Oncology, Seoul, Korea; ²Seoul National University Hospital, Surgery, Seoul, Korea; ³Seoul National University Hospital, Internal Medicine, Seoul, Korea

Background: To analyze the outcome of chemoradiotherapy (CRT) for extrahepatic bile duct cancer patients with gross residual disease after surgery, and to identify prognostic factors for these patients.

Methods and Materials: We retrospectively analyzed the data from 29 patients with extrahepatic bile duct cancer who had undergone CRT after bypass surgery ($n = 7$) or palliative resection (R2 resection) ($n = 22$) between January 2000 and April 2009. Most patients ($n = 24$) underwent CRT concurrently with 5-fluorouracil or capecitabine, and 19 out of them had maintenance chemotherapy. Nineteen and 10 patients were treated with continuous course radiotherapy (RT) and split course RT with a 2-week planned rest after 20 Gy, respectively. Six out of 7 patients who had bypass surgery received high dose RT (>50 Gy) in continuous course. The median radiation dose was 50 Gy (range; 40–60). The median follow-up period was 15.9 months.

Results: The actuarial overall survival rate at 2- and 5-years was 63.9% and 19.2%, respectively. The median survival time was 31.6 months. The 2- and 5-year disease-free survival, loco-regional progression-free survival and distant metastases-free survival rates were 38.3% and 19.2%, 31.5%

and 10.5%, and 31.7% and 19.0%, respectively. No survival difference was shown between bypass surgery and palliative resection group. All other factors did not affect the outcomes.

Conclusions: Bypass surgery group with high dose RT showed similar survival outcome to palliatively resected group. These results might suggest that dose escalation after bypass surgery in unresectable extrahepatic bile duct cancer patients could achieve comparable survival to R2 resection.

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POSTER

Cardiopulmonary Exercise Testing (CPET) as a Predictor of Outcome in a Mixed Hepatobiliary Surgical Cohort

D. Dunne¹, R. Jones¹, D. Grunhagen¹, D. Nunnery¹, R. Pinto², C. Lacasia³, H. Malik¹, G. Poston¹, S. Fenwick¹. ¹University Hospital Aintree, Hepatobiliary Unit, Liverpool, United Kingdom; ²University of Liverpool, Medical School, Liverpool, United Kingdom; ³University Hospital Aintree, Department of Anaesthesia, Liverpool, United Kingdom

Background: Cardiopulmonary exercise testing is a non-invasive method of quantifying a patients' level of fitness. Studies in mixed surgical populations have looked at the predictive value of CPET derived variables such as anaerobic threshold (AT). Anaerobic threshold has been shown to be useful in identifying patients at risk of increased post operative morbidity, mortality and those at risk of prolonged hospital stay. An AT <11 has been found to predict increased postoperative morbidity and mortality in series reporting on other types of major intra-abdominal surgery, but the predictive value of an AT < 11 in a hepatobiliary group of patients has not been identified.

Methods: We identified all patients who underwent preoperative CPET and subsequent hepatobiliary surgical intervention. Data recorded included demographic data, surgical procedure, postoperative length of stay (LOS), postoperative morbidity score (POMS) at day 5 and 8, incidence of elective critical care admission, reoperation, and readmission to critical care.

Results: 78 patients underwent CPET and Hepatobiliary surgical intervention between May 2008 and October 2010. Median age of patients was 70 (intra-quartile range (IQR) 63–75). 35 Liver Resection (Colorectal Liver metastasis), 16 Liver resection (Other malignant), 4 Liver resection (Benign), 6 radical cholecystectomy, 4 cholecystectomy, 3 open and close (irresectable), 2 other hepatobiliary. There was no statistically significant difference in the BMI or age of patients with an AT <11. Patients with AT <11 had a median LOS of 7 days (IQR 6–9), AT >11 median LOS 6 days (IQR 5–10) (p 0.432). Patients with an AT <11 had no increase in postoperative morbidity, elective critical care admission, readmission to critical care or reoperation. There was only one death within 90 days, due to malignant disease progression.

Conclusions: In a group of patients undergoing heterogeneous hepatobiliary surgical intervention, patients with an AT <11 have no significant increase in postoperative morbidity, elective critical care admission, readmission to critical care or reoperation. This highlights that the level of fitness patients require to undergo surgical intervention is procedure and patient specific, and that quantitative CPET data should be interpreted as such, rather than using arbitrary cut offs.

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POSTER

The Value of Cardiopulmonary Exercise Testing in Liver Resection

D. Nunnery¹, D. Dunne¹, R. Jones¹, R. Pinto², D. Grunhagen¹, C. Lacasia³, H. Malik¹, G. Poston¹, S. Fenwick¹. ¹University Hospital Aintree, Hepatobiliary Unit, Liverpool, United Kingdom; ²University of Liverpool, Medical School, Liverpool, United Kingdom; ³University Hospital Aintree, Department of Anaesthesia, Liverpool, United Kingdom

Background: Liver resection is the treatment of choice for many liver lesions. Historically resection was associated with a mortality of >10%, now this is below 5%. Advances in patient selection, surgical technique and post-operative care have contributed to this improvement. Despite improved mortality rates, current literature suggests morbidity rates remain high, ranging from 23%–56%. Various methods are used pre-operatively to try to identify patients at higher perioperative risk; however debate remains regarding the most appropriate method.

Cardiopulmonary exercise testing (CPET) has been used in mixed surgical populations. CPET detected variables including anaerobic threshold (AT) have used to identify patients at higher risk of post-operative morbidity, mortality and prolonged hospital stay. The value of CPET in patients undergoing liver resection has not been studied.

Methods: We identified patients who underwent preoperative CPET and subsequent Liver resection in our unit between 1/5/2008 and 1/10/2010. Notes, hospital computer system and a prospectively maintained database were reviewed retrospectively. Data recorded included demographic data, surgical procedure, postoperative length of stay (LOS), postoperative

morbidity score (POMS) at day 5, reoperation, and readmission to critical care.

Results: Full datasets were obtained on 55 patients who underwent CPET and liver resection. 35 male, 20 female. Mean age 70 years. Resections were carried out for Colorectal Liver metastasis 35, cholangiocarcinoma 9, hepatocellular carcinoma 4, Other malignancy 2, Benign disease 5. Mean 11.9 ml/kg/min, Mean Vo2 peak 18.5 ml/kg/min. 17 patients had an AT <11. Those with AT <11 had a mean LOS of 13 days, compared to 10 days in those with AT 11+ (p = 0.46). Patients with an AT <11 were more likely to have a POMS of 1 or greater at day 5 (p = 0.03). There were no significant differences in the age, BMI, or critical care readmission in either group. There was no mortality. There was a trend towards higher reoperation in those with an AT < 11 (p = 0.08).

Conclusions: CPET can be used to identify patients at higher risk of postoperative complications when undergoing Liver resection. This was not due to increased age or increased BMI. This could be used to better allocate critical care bed utilisation. There appeared to be a trend towards longer LOS, and higher reoperation rates in those with an AT <11, in a larger series this may become statistically significant.

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POSTER

Predictors of Recurrence After Pancreaticoduodenectomy for Ampullary Carcinoma

O.I. Dronov¹, Y.A. Kryuchyna¹, R.D. Dobush². ¹National Medical University, General Surgery, Kyiv, Ukraine; ²Kyiv City Clinical Hospital, General Surgery, Kyiv, Ukraine

Introduction: The prognosis for patients with carcinoma of the ampulla of Vater (AVC) is improved relative to other periampullary neoplasms, but recurrence of disease remain possible. The overall 5-year survival after radical resection is 50%. The aim of this study was to determine the clinicopathologic factors that influence long-term survival and type and curability recurrence after pancreaticoduodenectomy.

Methods: We reviewed 34 patients who underwent pancreaticoduodenectomy (PD) between August 2003 and August 2010 for AVC. Demographic, clinical, and pathologic data, recurrence rate and treatment were collected. The correlation between clinicopathologic factors and survival of patients after resection was examined by the Kaplan–Meier method, the log-rank test, and Cox proportional hazards regression.

Results: The mean follow-up was 23 month. The overall actuarial survival rates at 1, 3, and 5 years were 73.2%, 63.1%, 62.1% respectively. Nine patients recurred (7 month to 42 month). Factors that significantly influenced survival were perineural invasion (P < 0.001), lymph node status (P < 0.001), and degree of differentiation (P < 0.001) on univariate analysis. On multivariate analysis, both perineural invasion and lymph node status were the independent determinants of survival after resection. Histologic type (pancreatobiliary vs intestinal-type of tumour) was not a statistically significant factor for recurrence (p > 0.1). 4 patients underwent R0/R1-R2 resection for recurrence, 5 – chemotherapy.

Conclusions: Perineural invasion and lymph node status is associated with recurrence after pancreaticoduodenectomy for AVC and may identify candidates for adjuvant therapy. Recurrence after surgery can occur late and long follow-up it is usefulness after PD for AVC. Some patients with recurrence, especially with isolated liver metastases may be candidate for surgical treatment.

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POSTER

Results of Surgical Treatment for Hepatocellular Carcinoma Invading the Major Portal Vein or Inferior Vena Cava

H. Yoshidome¹, F. Kimura¹, H. Shimizu¹, M. Ohtsuka¹, D. Takeuchi¹, M. Miyazaki¹. ¹Chiba University Graduate School of Medicine, General Surgery, Chiba, Japan

Background: Patients with hepatocellular carcinoma invading the main trunk of the portal vein and the inferior vena cava have a dismal prognosis. The only hope for cure for such advanced cancer is an aggressive hepatectomy, but the best strategy for treatment is not well determined.

Methods: We retrospectively reviewed the medical records of 641 patients treated for hepatocellular carcinoma. In this series, 84 (13%) patients had hepatocellular carcinoma with a tumour thrombus invading the main trunk or the first-order branch of the portal vein, or the inferior vena cava. Thirty-four patients underwent hepatectomy and 50 patients underwent transcatheter arterial chemoembolization (TACE) alone. For time-to-event outcomes, the distribution of time to the first event were compared using the log-rank test, while the Kaplan–Meier method was used to estimate the absolute risk of each event for each group, and hazard ratios and 95% confidence intervals (CI) were estimated by the Cox proportional hazards model. To identify the baseline and clinical variables associated with the