and 8.8±8.7% in group 3, respectively. Statistically significant differences of overall survival haven't been obtained (p = 0.06). The influence of TACE with oxaliplatin on RFS and OS has been demonstrated by Cox regression analysis (HR 0.24 [95% CI 0.09–0.64], p = 0.003 for RFS and HR 0.28 [95% CI 0.09–0.86], p = 0.014 for OS).
Conclusions: Using TACE with oxaliplatin and LR in CRC resectable liver metastases patients has improved recurrence-free survival and has reduced disease recurrence and death risks. Phase III of clinical trial is under consideration.

6049 POSTER

Phase II Study of Neoadjuvant Chemoradiotherapy With Oxaliplatin-Containing Regimen in Locally Advanced Rectal Cancer

J.H. Baek[1], W.S. Lee[1], D.B. Shin[2], S.J. Sym[2], K.A. Kwon[3], K.C. Lee[4], S.H. Lee[4], D.H. Jung[5]. *[1]Gachon University of Medicine & Science Gil Medical Center, Surgery, Incheon, South Korea; [2]Gachon University of Medicine & Science Gil Medical Center, Hemato-Oncology, Incheon, South Korea; [3]Gachon University of Medicine & Science Gil Medical Center, Gastroenterology, Incheon, South Korea; [4]Gachon University of Medicine & Science Gil Medical Center, Radiation Oncology, Incheon, South Korea; [5]Gachon University of Medicine & Science Gil Medical Center, Pathology, Incheon, South Korea*

Background: Preoperative fluorouracil (FU)-based chemoradiotherapy was associated with improved local control and less toxicity but did not improve overall survival. Oxaliplatin also has radiation sensitization properties. Patients with pathological complete response (ypCR) following chemoradiation have better survival than do those without ypCR.
Purpose: The aim of this study was to assess tolerance of this regimen and evaluate the response of rectal cancer following chemoradiotherapy containing oxaliplatin preoperatively.
Methods: Between August 2008 and August 2010, thirty patients with clinical T3/T4 or N+ rectal adenocarcinoma located in mid or lower rectum without metastasis were entered onto the study in single institute. Data were analyzed according to the intention-to-treat principle. Leucovorin was administered at 20 mg/m^2 followed by continuous infusion of 5-FU of 350 mg/m^2 on days 1 to 5 and 29 to 33. Oxaliplatin was administered at 130 mg/m^2 on days 1 and 29 simultaneously with leucovorin. Radiation dose was 180 rad/fraction to a total dose of 50.4 Gy (28 fractions). Surgery was scheduled 6 to 8 weeks after completion of chemoradiotherapy. Adverse effects were graded according to the Common Toxicity Criteria of the National Cancer Institute. Tumours following surgery were graded by tumour regression. All statistical analyses were conducted using SPSS 18.0. This study was approved by the institutional review board of our institution.
Results: Thirty one patients were entered onto the study. Six patients (19.4%) experienced grade 3 diarrhea. Grade 2 nausea and vomiting occurred in 5 and 2 patients, respectively. Severe neurotoxicity was not observed: grade 1 sensory neuropathy occurred in 10 patients (32.3%). Myelosuppression was mild and grade 2 anemia, neutropenia, and thrombocytopenia occurred in 2, 2, and 1 patient, respectively.
All patients underwent surgical resection: 23 underwent low anterior resection, 6 had coloanal anastomosis, and 2 received Hartmann's procedure. Sphincter-saving surgery was performed in 28 patients (93.5%). Mean distance of the tumour from anal verge was 5 cm. Anastomotic leakage occurred in 4 of 29 (13.8%) patients with anastomosis. Mean number of harvested lymph nodes was 8.4. Mean distal margin of tumour was 1.5. The circumferential resection margin was involved in two patients (6.5%). Overall 24 patients (77.4%) responded to the treatment. Four of the 31 patients (12.9%) taken to surgery had ypCRs. When ypCR was combined with only few residual cells, the rate was 22.6%.
Conclusion: The overall toxicity of combined oxaliplatin to continuous infusion of 5-FU and radiation was well tolerable. The neoadjuvant chemoradiation with oxaliplatin-containing regimen for patients with locally advanced rectal cancer was associated with higher rates of sphincter preservation and down-staging. Further prospective randomized trials are necessary to better define the benefits as oncologic outcomes.

6050 POSTER

A 12-week Regimen With Interdigitating FOLFOX Chemotherapy and Pelvic Chemoradiation for Simultaneous Primary and Metastatic Rectal Cancer

S. Ngan[1], J. McKendrick[2], M. Bressel[3], T. Leong[1], P. Cooray[2], A. Heriot[4], M. Steel[5], S. Chander[1], B. McClure[3], M. Michael[6]. *[1]Peter MacCallum Cancer Centre, Radiation Oncology, Melbourne, Australia; [2]Box Hill Hospital, Medical Oncology, Melbourne, Australia; [3]Peter MacCallum Cancer Centre, Centre for Biostatistics & Clinical Trials, Melbourne, Australia; [4]Peter MacCallum Cancer Centre, Surgical Oncology, Melbourne, Australia; [5]Box Hill Hospital, Colorectal Unit, Melbourne, Australia; [6]Peter MacCallum Cancer Centre, Medical Oncology, Melbourne, Australia*

Background: Chemotherapy dose used during chemoradiation is adequate for radiosensitization but suboptimal for systemic control. The aim of this study was to evaluate tolerability, and local and systemic benefits of a new treatment regimen delivering intensive chemotherapy and radical radiotherapy in an interdigitating manner. (ClinicalTrials.gov Identifier: NCT00422864)
Materials and Methods: This was a single arm prospective study for patients presenting with untreated simultaneous symptomatic primary and metastatic rectal cancer. The treatment regimen was 12 weeks long. FOLFOX chemotherapy (oxaliplatin 100 mg/m^2 day 1, leucovorin 200 mg/m^2 day 1, 5-FU 400 mg/m^2 bolus day 1, then continuous infusion 2.4 g/m^2 over 46 hours) was given in week 1, 6, and 11. Pelvic radiotherapy (25.2 Gy in 3 weeks in 1.8 Gy/fr with concurrent oxaliplatin 85 mg/m^2 day 1 and 5-FU continuous infusion 200 mg/m^2/day) was given in week 3−5, and week 8−10. In total, patients received, in 12 weeks, 3 courses of FOLFOX and pelvic radiation 50.4 Gy with concurrent oxaplatin and 5-FU. All patients were staged with CT, MRI and PDG-PET before and after treatment.
Results: Twenty-six patients were treated in this study. The mean age was 61 (range 33−82) years. 69% were male. MRI stage of the rectal primary was T2 4%, T3 81% and T4 15%. Liver, lung, and extra-pelvic nodal metastases were present in 81%, 35% and 23% of patients, respectively. 38% of patients had more than one site of metastatic disease. Twenty-four patients (92% [95% CI:75%-99%]) completed the 12-week treatment regimen. All patients received the planned radiation dose. 65% (95% CI:44%-83%) of patients received the planned number of courses of oxaliplatin with 88% of patients receiving at least 75% of the protocol oxaliplatin dose. In this 12-week period, grade 3 toxicities were neutropenia 23%, diarrhoea 15%, and radiation perineal skin reaction 12%. All grade 4 toxicity was due to neutropenia 15%. There was no febrile neutropenia. PET metabolic response (CR+PR) rate for rectal primary was 96% (95% CI:80%-100%). Overall PET metabolic response rate for metastatic disease was 60% (95% CI:39%-79%) (CR rate 16%).
Conclusions: It is feasible to deliver intensive chemotherapy and radiotherapy to treat primary and metastatic rectal cancer simultaneously. High completion and response rates are encouraging. This regimen is the subject of a current phase II neoadjuvant trial for resectable rectal cancer (TROG 09.01).

6051 POSTER

Combined Modality Treatment in Anal Canal Carcinoma − Impact of Full Dose Treatment and Clinical Stage Category on Outcomes

C. Solé[1], V. Ovalle[1], M. Russo[2], S. Solé[1], R. Rivera[1], M. Baeza[1]. *[1]Instituto de Radiomedicina, Radioterapia, Santiago, Chile; [2]Instituto de Radiomedicina and Universidad Diego Portales, Facultad de Medicina, Santiago, Chile*

Background: Since N Nigro's report in 1974, combined modality treatment, chemo-radiotherapy (CCRT), has been the standard in anal canal carcinoma. We report the results of this treatment with regard to compliance, toxicity, clinical outcomes and we intent to determine if full dose treatment and clinical stage has an impact in this patient group.
Material and Methods: Between 1999 and 2009, 42 patients received CCRT with no planned gap (45 Gy at 1.8 Gy/fraction +/− boost 9 Gy at 1.8 Gy/fraction; 5-fluorouracil, 1000 mg/m^2, Days 1−4 and 29−32, mitomycin C, 10−15 mg/m^2, Days 1 and 29). Median age 62 years (28−83); 11 (26%) males (6 HIV positive), 31 (74%) females; Stage I = 6 (14%), II = 13 (31%), IIIA = 8 (19%), IIIB = 15 (36%). Median overall treatment time (OTT) was 35 (14−53) days, 36 (81%) patients received full dose treatment (FDT), 2 patients had grade 4 toxicity, and 1 treatment related death. Median follow up was 63.8 months with a minimum of 25 months.
Results: For the whole study sample Kaplan–Meier 5-year rate of loco-regional control (LRC) was 78%, colostomy free survival (CFS) 73%, distant metastases free survival (DMFS) 76%, disease free survival (DFS) 65% cancer-specific survival (CSS) 69% and overall survival (OS) 46%. The

42 patients accrued, were analyzed for outcomes by clinical stage into 2 groups (I, II, IIIA vs. IIIB) and compared using log-rank test with significant differences in OS ($p = 0.002$); CSS ($p > 0.000$); DFS ($p > 0.000$); DMFS ($p > 0.000$); CFS ($p > 0.000$); LRC ($p > 0.000$). Patients who received FDT had a significantly better OS ($p = 0.004$) and CSS ($p = 0.01$).
Conclusions: In our experience clinical stage category of disease has a significant impact in all analyzed outcomes, patients who received FDT had an improvement in OS and CSS. Results for more advanced tumours (IIIB) remain poor, and require strategies to improve outcome. Higher doses or better treatment compliance may be required. We discourage planned treatment gaps.

6052 POSTER

Preoperative Radio-chemotherapy in Locally Advanced Rectal Cancer − Prognostic Value of Time Interval to Surgery on Cancer Specific Survival

C. Solé[1], M. Russo[2], V. Ovalle[1], R. Rivera[1], S. Solé[1], M. Frelinghuysen[3], M. Baeza[3]. *[1]Instituto de Radiomedicina, Radioterapia, Santiago, Chile; [2]Instituto de Radiomedicina and Universidad Diego Portales, Facultad de Medicina, Santiago, Chile; [3]Universidad de Chile, Radioterapia, Santiago, Chile*

Background: The last decade, preoperative chemoradiation has been the cornerstone in the intent to improve locoregional control in rectal cancer. Pathologic complete response has been associated to a better prognosis, mostly in terms of decreasing local recurrence. We planned a retrospective analysis of a series of cases treated with preoperative chemoradiation for rectal cancer in our institution. We intend to identify other prognostic factors, such as the interval to surgery, of locoregional control and cancer specific survival.
Methods: 347 patients with the diagnosis of locally advanced rectal cancer were treated preoperatively between 2000 and 2010. The median time to surgery was 57 days. 86% of the patients received a full chemoradiation treatment. Sphincter preservation and abdominoperineal resection were preformed in 65% and 35% of the patients respectively. Total mesorectal excision was accomplished in 51% of the patients. 27% were given postoperative chemotherapy. Survival estimates were obtained using Kaplan–Meier curves and Cox proportional Hazard model and logistic regression odds ratio were used in the multivariate analysis.
Results: With a median follow up of 69 months, at 5 years local control, distant recurrence free survival, disease specific survival and overall survival were 92, 75, 80 and 70% respectively. 95 patients (27%) had recurrences through out our follow up, 27 were locoregional recurrences and 84 failed distantly. In the multivariate analysis the most significant preoperative prognostic factor in cancer specific death was an interval to surgery $\geqslant$ 50 days (HR 1.8; $p = 0.03$). We preformed a multivariate analysis to determine which factors influenced pathologic complete response and total mesorectal excision. The most significant factor was an interval to surgery <50 days (OR 2.1; $p < 0.00$ and OR 2.2; $p < 0.00$ respectively).
Conclusions: Preoperative chemoradiation in locally advanced rectal cancer is an effective treatment, with good locoregional control and an excellent cancer specific survival. The most significant preoperative prognostic factor in cancer specific survival was the time to surgery interval. Efforts must be made not to delay surgery after preoperative radio-chemotherapy.

6053 POSTER

Prognostic Significance of the Lymph Node Ratio on the Treatment Outcome in Rectal Cancer

M.R. Ryu[1], J.Y. Kim[1], J.H. Lee[1], M.J. Chung[1], I.K. Lee[2], S.J. Yoo[2], C.H. An[2], J.M. Won[2], S.K. Chang[2], S.M. Chung[1]. *[1]College of Medicine The Catholic University of Korea, Department of Radiation Oncology, Seoul, South Korea; [2]College of Medicine The Catholic University of Korea, Department of General Surgery, Seoul, South Korea*

Background: This study evaluated the prognostic impact of the lymph node ratio (LNR, ie, the ratio of positive to dissected lymph nodes) on recurrence and survival in rectal cancer patients who received curative intent surgery and postoperative concurrent chemoradiation therapy (CCRT).
Materials and Methods: Between 1995 and 2008, 124 pathologic T3−4 or node positive rectal cancer patients were referred for postoperative CCRT. Radiotherapy was performed, median dose of 50.4 Gy (range, 45–59.4) for 6 weeks to the whole pelvis. Chemotherapy was bolus injection of 5-fluorouracil and leucovorin for the first and last week of radiotherapy (n = 114, 91.9%) or capecitabine daily administered during radiotherapy (n = 10, 8.1%). Further adjuvant chemotherapy was done after CCRT. Disease free survival (DFS) and disease specific survival (DSS) rates were estimated by the Kaplan–Meier method. The prognostic significance of the LNR was evaluated by multivariate analysis using Cox proportional hazard modeling with or without LNR as a covariate.
Results: Median follow-up was 5.1 years (range, 0.4–16.0). The median age was 62 years (range, 21−80). The median number of nodes removed was 18 (range, 6−81). By minimum p value approach, 0.2 was the cutoff value of LNR at which most significant difference in DFS and DSS was observed. The patients were classified into two groups: patients with LNR $\leqslant$ 0.2 and LNR > 0.2, which represented 66.9% and 33.1% of the study cohort, respectively. The DFS and DSS rates correlated significantly with clinical N stage, pathologic N stage, lymphatic, vascular or perineural invasion and LNR ($\leqslant$0.2 vs. >0.2). In multivariate analysis, pathologic N stage and lymphatic invasion were significant prognostic factors for DFS and DSS ($p < 0.05$). However, when the LNR was included as a covariate in the model, the LNR was highly significant ($p < 0.001$), and the number of positive nodes lost its significance ($p > 0.05$).
Conclusions: The LNR predicts recurrence and survival more accurately than pathologic N classification in our study. The number of positive nodes and LNR should be considered together in risk estimates for rectal cancer patients.

6054 POSTER

The Impact of Serum Carcinoembryonic Antigen (CEA) Normalization on Survival in Rectal Cancer Treated With Preoperative Chemoradiation

M.N. Yu[1], M.J. Chung[1], J.Y. Kim[1], I.K. Lee[2], J.G. Kim[2], C.H. An[2], S.J. Yoo[2], S.K. Chang[2], S.M. Chung[1], M.R. Ryu[1]. *[1]College of Medicine The Catholic University of Korea, Radiation Oncology, Seoul, South Korea; [2]College of Medicine The Catholic University of Korea, General Surgery, Seoul, South Korea*

Background: This retrospective study was to evaluate impact of CEA normalization on survival in rectal cancer patients who received curative intent surgery after preoperative chemoradiation (CRT).
Materials and Methods: Between July 1996 and June 2010, 109 patients underwent surgery for histologically confirmed rectal cancer after preoperative CRT. The dose of radiotherapy was median 50.4 Gy (range, 43.2–54.4) for 6 weeks. Chemotherapy was bolus injection of 5-fluorouracil and leucovorin for the first and last week of radiotherapy (n = 84, 77.1%) or capecitabine daily administered during radiotherapy (n = 18, 16.5%). Low anterior resection (n = 90, 82.6%) or abdominoperineal resection (n = 19, 17.4%) was performed median 47 days from the end of radiotherapy, and then 4 cycles of adjuvant chemotherapy was done. Down staging was defined as the lowering of the T, N stage between pretreatment CT and pathological stage. Serum carcinoembryonic antigen (CEA) level was checked at initial diagnosis and just before surgery. Disease free survival (DFS), distant metastasis free survival (DMFS) and overall survival (OS) rates were estimated by the Kaplan–Meier method, and the Cox proportional hazard model was used in multivariate analyses.
Results: After median follow-up of 48 months (range, 9–174), 5-year DFS was 72.5% and 5-year OS was 76.7%. The initial CEA level and normalization CEA after CRT were significant prognostic factor for DMFS and OS ($p = 0.0004$, $p = 0.0051$ and $p = 0.0152$, $p = 0.0004$, respectively). The downstaging of T and N occurred in 34 (31.2%) and 70 patients (64.2%), respectively. Univariate analyses indicated that pT, pN, perineural invasion(PNI), lymphatic invasion(LI) were significant prognostic factors for DFS. cT, pT, pN, PNI, LI were significant predictive factors for OS. In multivariate analyses, pT, downstaging of N and PNI were significantly associated with improving DFS ($p = 0.017$, $p = 0.013$ and $p = 0.002$, respectively). The cT, PNI were significant prognostic factors for OS ($p = 0.013$, $p = 0.001$, respectively).
Conclusions: In our study, clinical or pathologic stage, initial CEA level were again confirmed to be prognostic factors for survival in rectal cancer patients. However, it is first suggested that patients who achieved normal CEA level at the time of surgery had more favorable outcome than who kept high CEA level after preoperative CRT. The normalization of CEA level could provide important information about prognosis in rectal cancer treatment.

6055 POSTER

Dosimetric Comparison of Three Dimensional Conformal Radiotherapy With Intensity Modulated Radiotherapy & Bone Marrow Sparing Intensity Modulated Radiotherapy in Preoperative Radiation of Locally Advanced Carcinoma Rectum

A. Biswas[1], S. Mallick[1], S. Sharma[1], D. Manigandan[1], A. Chakrabarty[2], B.K. Mohanti[1], G.K. Rath[1]. *[1]All India Institute of Medical Sciences, Radiotherapy & Oncology, Delhi, India; [2]Indian Statistical Institute, Statistics and Mathematics Unit, Delhi, India*

Background: We compared target coverage, conformity, homogeneity, normal tissue avoidance and irradiated body volume in 3 sets of