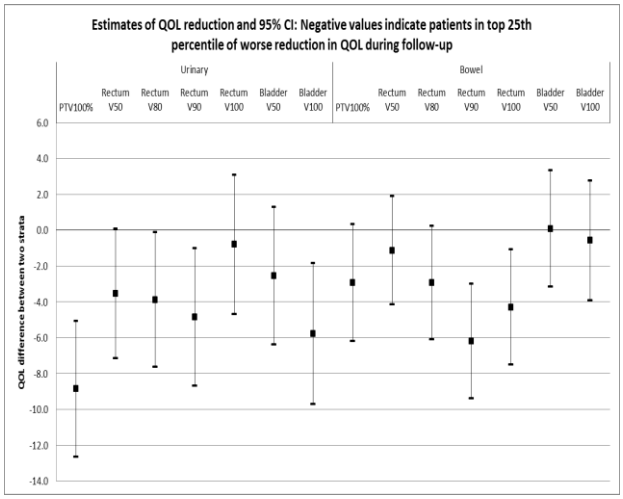

PO-0723

Data mining tools for predicting the risk of toxicity in prostate cancer patients treated with radiation therapy

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Purpose/Objective: Clinical data mining is the automated analysis of clinical data repositories in order to extract patterns representing knowledge. The aim of this study was the prognostic factors assessment of prostate cancer (PC) patients treated with radiation therapy using data mining tools.

Materials and Methods: We have applied two methods to extract the rules. First, we have used quantitative techniques, where the numerical values of the variables are taken into account. In particular, we have applied the C4.5, Ripper and Part algorithms. The C4.5 algorithm is a rule based classifier and we derive rules from the decision tree built. The Ripper algorithm is a propositional rule learner, and the Part algorithm is a separate-and-conquer rule learner. Then, we used the framework toolkit Weka to execute the algorithms. Second, we have used qualitative techniques, where the values of the variables are treated as tags, and therefore, numerical variables need to be discretized before applying the algorithms. In particular we have applied Subgroup Discovery, a data mining technique which combines both predictive and descriptive induction in order to find interesting relationships among different variables in a dataset, regarding a specific property of interest. Then, we have executed this algorithm in the RapidMiner toolkit. Genitourinary (GU) and gastrointestinal (GI) toxicity was scored using the Radiation Therapy Oncology Group (RTOG) scoring system. Potential risk factors for moderate/severe toxicity (grade ≥2) were assessed.

Results: A data set of 162 PC patients treated with dynamic conformal arc therapy from 2006 to 2012 was assessed. The dose prescribed to the prostate ranged between 68-81Gy. The median age was 69 years (range 43-87 years). The median follow-up was 18 months (range 2-74 months). The rates of acute grade 2 GI and genitourinary GU toxicities were 19.7% and 17 %, respectively. Only one patient experienced acute grade 3 GI toxicity whereas 11 patients (6.7%) experienced acute grade 3 GU toxicity. After using data mining analysis, ten different rules were described for predicting GI and GU toxicities with an area under the curve (AUC) range from 0.63 to 0.68 and 0.55 to 0.66, respectively. There was not a statistically significant difference among the predicting rules for GI toxicity (P = 0.138). The higher AUC (0.68) was for the rule which included patients with pelvic lymph node volumes ≥179cc and prostate-specific antigen (PSA) at diagnosis ≤ 7.5 ng/mL. In terms of GU toxicity, there was a statistically significant difference among the predicting rules (P = 0.0019). Patients with high risk PC, a radiation time ≥median, and a maximum bladder dose ≥median achieved the higher AUC (0.66) for predicting grade ≥2 GI toxicity.

Conclusions: Aggregating data mining analysis for predicting toxicity is beneficial for patient's classification and may improve the selection of trial candidates according the risk for toxicity.

PO-0724

Outcome of Choline PET-CT guided salvage hypofractionated Tomotherapy for lymph-nodal recurrent prostate cancer

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Purpose/Objective: To report the outcome and toxicity results of 11CCholine PET-CT guided salvage hypofractionated tomotherapy for lymph-nodal recurrent prostate cancer pts treated in a single center.

Materials and Methods: From February 2005 to March 2013, 83 relapsed prostate cancer pts were treated on the lymph nodal relapse with high dose moderately hypofractionated Tomotherapy (HTT), guided by 11CCholine PET/CT (PET/CT0). All pts had undergone previous radical treatments: prostatectomy (PR), radiation therapy (RT) or PR + RT as first line treatment and all received hormonal or chemotherapy treatment for increased PSA values. Two pts were treated 3 times, six pts twice; thus the total number of therapies delivered was 95. In 89/95 PET/CT0 (on the 83 pts) para-aortic and/or pelvic lymph nodal metastases (LNMs) were observed, while in 6 PET/CT0 mediastinal LNMs. Pelvic and/or lombo-aortic lymph nodal areas were treated to 51.8 Gy/28 fractions and PET/CT0 positive lymph nodes were treated with high dose using a simultaneous integrated boost to a median total dose of 65.5 Gy. A Mega-Voltage CT scan (MVCT) was performed before each fraction to correct patient setup and to reduce PTV margin and side effects to surrounding tissues. All patients continued the previous hormonal therapy during HTT treatment. Acute toxicity was available for all treatments while late events were considered in 49 patients with a follow-up of at least 2 years. Actuarial overall survival (OS), loco-regional (LRFS) and clinical relapse-free survival (CRFS) were calculated with the Kaplan-Meyer method. The main clinical predictors of OS were assessed with Cox univariate and multivariate analyses.

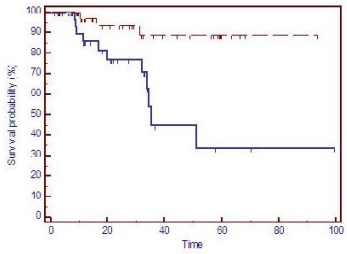

Figure 1: Impact of PSA Nadir <0.1 ng/ml on Overall Survival (p=0.002)

Results:

Grade	GU	GI	Rectal
0	84(89.4%)	63 (67%)	72 (76.6%)
1	5(5.3%)	27(28.7%)	19 (20.2%)
2	3(3.2%)	4(4.3%)	3 (3.2%)
3	2(2.1%)	0	0

Table I: Acute toxicity of PET/CT guided salvage hypofractionated Tomotherapy in 83 lymph-nodal relapsed patients.

The treatment was well tolerated in all patients: acute toxicity are reported in Table I; ≥ grade 2 rectal and GU late incidence was 3.2% and 8.4% respectively.

With a median follow-up of 22 months (range: 3-99.3) 83/95 treatments presented a significant reduction of PSA value after HTT. Of the 19 pts with PET/CT1 evaluation without PSA rise after salvage PET/CT guided tomotherapy, 14 presented Complete Metabolic Response and 2 Partial Metabolic Response. The 2-y OS, LRFS and CRFS were 87.3%, 90.0% and 50.1% respectively. A nadir <0.1 ng/ml and PSA reduction of more than 80% at 3 and 9 months together with PET/CT0 positive LN location (extra vs intra-pelvic) and 2 Gy equivalent dose to PET/CT0 positive LN (EQD2) were found to have a significant impact on OS (see fig. 1). In a multi-variable model (p=0.0004, AUC=0.81, 95%CI:0.71-0.89), a nadir <0.1 ng/ml (HR:0.28), estra-pelvic PET/CT0 positive LN (HR:7.9) and EQD2>69Gy (HR:0.39) were independently predictive of the risk of death.