treatment thereafter, their prognosis has been improving. We analyzed the results of our 18-year experience.

**Materials and Methods:** Between 1993 and April 2011 48 patients (68 times) were treated. Their age ranged from 46 to 86 with a median of 64. There were 20 male patients and 28 females. Seventeen patients were unable to walk before IORT, while the remaining 31 were ambulant. IORT was given with proper energy electron beam from posteriorly shielding the spinal cord with lead of proper thickness. The doses of IORT ranged from 16Gy to 26Gy with a median of 20Gy. Ten patients received IORT more than once (2 to 6 times).

External beam radiation therapy was administered in 29 patients, of which 1 received preoperatively (24Gy), 20 received postoperatively (20–40Gy, median 35.5Gy). All patients received thyroid stimulating hormone suppression therapy. Radioactive iodines (Iodine-131) were administered in 29 patients. Median follow-up period was 33 months.

**Results:** Among 17 patients who had been unable to walk 15 became able to walk following IORT, while the remaining 2 died soon after the treatment (response: not evaluable). Overall median survival time of overall patients was 38 months. Three- and 5-year overall survival rates were 51% and 33%, respectively. Symptomatic recurrence was observed in 6 cases (14%).

**Conclusions:** Well-differentiated thyroid cancer patients carried quite favorable prognoses considering their status prior to IORT. From our experience, agressive treatment was justified since more than half of the patients survived 3 years and about one third of the patients survived 5 years. Furthermore, only small portion of the patients suffered from symptomatic recurrence. Our methods were very promising both for quantity and quality of life in the treatment of spinal metastases from well-differentiated thyroid cancer.

**OC-0520**

**Kyphoplasty and IORT for spinal metastases: dose escalation study & clinical data update**

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**Purpose/Objective:** Kyphoplasty combined with intraoperative radiotherapy (Kypho-IORT) is a novel treatment modality for patients with spinal metastases. The technical feasibility and the operation principle of this approach have been described. In this study we present the results of the conducted phase II dose escalation study (NCT 01280032) and update the clinical data of a pilot phase.

**Materials and Methods:** For Kypho-IORT the INTRABEAM system (Carl Zeiss Surgical, Oberkochen, Germany) with a specially designed applicator was used. In the phase II study three dose escalation levels were tested: 8 Gy in 8 mm, 8 Gy in 10mm and 8 Gy in 13 mm depth from the isocenter of the radiation source. Inclusion criteria were age of ≥ 50 years, Karnofsky-Index of ≥ 60% and histologically or radiologically ≤ 2cm caudal the 3rd thoracic vertebra. Off-study patients were treated analogue the first two dose levels.

**Results:** Overall 61 patients received a Kypho-IORT. 5/10 before Kypho-IORT to median VAS 2/10 first day after Kypho-IORT (p<0.001). 3, 6 and 9 months after Kypho-IORT also a significantly pain reduction compared to the preoperative situation was seen in the entire cohort (n= 33, 21, 18 patients, respectively; all p <0.005). For the on-study patients the 3, 6 and 12 months local PFS was 100%, 83.3% and 83.3%. The median pain improvement was also significant (VAS 4/10 preoperatively vs. VAS 1/10 postoperatively, p=0.018). For the off-study patients the 3, 6 and 12 months local PFS was 96.9% respectively. The median pain score significantly improved from VAS 5/10 before the procedure to VAS 2/10 at the first postoperative day (p<0.001). There were no dose-limiting toxicities in the three dose escalation levels.

**Conclusions:** Kypho-IORT is an alternative therapy approach for patients with spinal metastases in the palliative treatment setting with good local tumor control and immediate and permanent pain relief without severe side effects. A dose of 8 Gy in 13 mm depths from the isocenter could be determined as a save maximally tolerated dose and will be consolidated in a phase III study.
presented for the entire cohort. Univariate and multivariate subgroup analysis will be performed to identify possible prognostic factors using the log rank test and the Cox regression method, respectively. Rates of severe side effects and complication rates will be reported descriptively.

Conclusions: This pooled analysis offers the opportunity to evaluate the efficacy and toxicity of a multimodal treatment approach including IORT, EBRT and gross total limb-sparing surgery in a large series of patients with extremity sarcoma treated in European expert centers and therefore may serve as a benchmark for other treatment approaches.

OC-0522
Post-chemoradiation intraoperative electron-beam radiation therapy boost in T4 rectal cancer
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Purpose/Objective: Patients with locally advanced rectal cancer have a dismal prognosis.

Materials and Methods: We investigated outcomes in 77 consecutive patients with T4 tumors treated with preoperative chemoradiotherapy (CRT), surgery and IOERT.

Results: Median follow-up was 62.8 months (range, 4-198). 5 year Loco-regional control, disease-free survival and overall survival was 84%, 68% and 65%.

Conclusions: Overall results after multimodality treatment of T4 are promising. Classification of risk factors for LRR would contributed to propose a prognostic index that could allow us to guide risk-adapted tailored treatment

Poster Discussion: Dose modelling and planning

PD-0523
Fractionation-corrected doses with deformable registration as a tool for treatment plan comparison
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Purpose/Objective: In radiotherapy treatment planning for patients with tumor relapse, a number of factors must be taken into account, such as prior treatments to the area, total dose to critical organs, and dose-per-fraction effects within the patient volume. The aim of this study was to develop a simple tool to explore 3D biological dose summation with non-rigid fusion, and to demonstrate its importance in treatment planning.

Materials and Methods: Fine-scale deformable image registration was carried out in Mirada RTx™ (Mirada Medical Ltd., Oxford, UK), and inspected for plausibility using registration QC tools (see Fig 1C). The deformation grids were used to transform dose distributions from prior treatments into the space of the current target CT. Thus, given the number of fractions in each treatment plan, the fractional doses for every voxel in the new planning CT volume were calculated for each treatment.

The software used the linear-quadratic (LQ) model for equivalence calculations, and doses were expressed as 2Gy equivalent dose (EQD2), which were summed voxel-wise to give the EQD2 for the total treatment. The interface was designed to allow users to specify different alpha/beta-ratios per structure on the planning CT, and also to enter a healing parameter to down-scale effects of past treatments. An illustrative H&N case is presented. A malignancy on the left side of the tongue received standard three dose level simultaneously integrated boost (SIB) treatment (33x2/1.82/1.64Gy at 66/60/54Gy) with a seven field 6MV IMRT technique. The planning CT and PTVs are shown in Fig 1A. Two years after the primary treatment, the patient experienced a relapse on the right side, and a 25x2Gy treatment was planned for the new PTV (Fig 1B). Even after positioning the patient to minimize the difference between CTS, the large tissue deformations due to tumor mass and neck rigidity presented a challenging registration problem. Total doses (in EQD2) to critical organs were investigated, using alpha/beta-ratios of 2.1Gy for the medulla, and 3Gy for other organs.