showed average of 64.94 ± 0.84 mGy and 37.64 ± 1.20 mGy in left ovary part and average of 64.38 ± 1.85 mGy and 32.96 ± 1.11 mGy in right ovary part. This showed when executing Tomotherapy, measured scattered dose of Tomo Helical method which has relatively greater monitor units (MUs) and longer irradiation time are approximately 1.8 times higher than Tomo direct method.

Conclusions: Scattered dose of left and right ovary of childbearing women is lower than ICRP recommended does which is not seriously worried level against the infertility and secondary cancer occurrence. However, as breast cancer occurrence ages become younger in the future and radiation therapy using high-precision image guidance equipment like Tomotherapy is developed, clinical follow-up studies about the ovary dose of childbearing women patients would be more required.

EP-1639

Dosimetric comparison of techniques and impact of displacements in lower limb sarcoma radiation therapy

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Purpose/Objective: Radiation therapy (RT) is frequently used as an adjunctive treatment for soft tissue sarcoma of the lower limb. RT carries a risk of long term side effects including limb fibrosis, joint stiffness, lymphoedema and bone fractures. This study compared dosimetric data between 3DCRT and IMRT plans in a population of lower limb sarcoma patients immobilised with an in-house device and quantified the impact of systematic and random errors on these techniques. The dosimetric effect of translational displacements on target coverage and organs at risk (OARs) were considered.

Materials and Methods: Eleven anonymised patients' CT data were acquired. Patients had previously been treated with postoperative radiotherapy. A 3DCRT and IMRT plan was created for each patient. Total doses ranged from 60-66 Gy, prescribed at 2 Gy per fraction. The techniques were dosimetrically compared. Population-based systematic errors were applied to 3 fractions of each 3DCRT and IMRT plan. Population-based random errors were applied to 5 fractions of each 3DCRT and IMRT plan. The dose metrics were analysed and the results were compared to the initial plans.

Results: Higher target D95, D2, D98, D50 and the best homogeneity index resulted with IMRT compared to 3DCRT ($p<0.01$). Maximum bone dose was higher in IMRT than 3DCRT ($p<0.0001$). Systematic errors increased target D2 in IMRT ($p<0.05$). Random errors decreased target homogeneity in IMRT ($p<0.05$), decreased mean dose to bone in both 3DCRT and IMRT, and decreased bone V40 in 3DCRT. Neither random nor systematic errors increased OAR dose for IMRT or 3DCRT plans.

Table 1. Dosimetric comparison of 3DCRT and IMRT plans

Variable	N	3DCRT Mean ± SD	IMRT Mean ± SD	Paired t-test p value
D95 PTV_Eval phase 1 (Gy)	11	47.12 ± 1.38	50.26 ± 0.63	**0.000**
D2 PTV_Eval phase 1 (Gy)	11	52.81 ± 0.87	54.36 ± 1.22	**0.000**
D98 PTV_Eval phase 1 (Gy)	11	45.54 ± 1.41	49.00 ± 0.65	**0.000**
D50 PTV_Eval phase 1 (Gy)	11	50.39 ± 0.80	52.83 ± 1.08	**0.000**
HI PTV_Eval phase 1	11	0.1443 ± 0.0277	0.1012 ± 0.0208	**0.002**
D95 CTV phase 1 (Gy)	10	44.60 ± 6.27	47.32 ± 6.79	**0.003**
Dmax bone combined phases (Gy)	11	63.57 ± 3.25	67.25 ± 3.22	**0.000**
V40 bone combined phases (%)	11	43.29 ± 18.34	40.12 ± 20.73	0.354
Dmean bone combined phases (Gy)	11	28.04 ± 10.40	29.71 ± 10.99	0.266

Abbreviations: Gy= gray, 3DCRT= 3D conformal radiation therapy, IMRT=intensity-modulated radiation therapy, D95= dose received by 95% of the volume, D2= dose received by 2% of the volume, D50= dose received by 50% of the volume, HI= homogeneity index, V40= % of volume receiving 40 Gray, Dmean= mean dose, N= number of patients.

Conclusions: IMRT could become the favoured lower limb sarcoma radiation therapy technique due to superior target coverage and homogeneity. However, higher bone Dmax seen with IMRT compared to 3DCRT potentially increases the risk of late bone toxicity. Offline imaging can adequately correct for systematic translational errors in these patients when an in-house immobilisation device is used. Results would indicate that to maintain target homogeneity in IMRT, daily online imaging would be required to reduce the effects of random displacements as well as quantifying daily rotations. Rotational displacements should be simulated in further study, as rotations may potentially have a further dosimetric effect on target coverage and OARs if not corrected for.

EP-1640

Comparison of time-benefit ratio between in vivo dosimetry and pre-treatment verification in IMRT breast treatment

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Purpose/Objective: Pre-treatment verifications of IMRT treatments are routinely performed by measuring the absorbed dose at a representative point in a water-equivalent phantom using an ionization chamber. We evaluated the added value of performing entrance dose *in vivo* dosimetry (IVD) using diodes in breast treatments delivered using a SIB-IMRT technique.

Materials and Methods: We studied 14 breast treatments delivered by a Clinac 2100C/D using a 6MV photon beam SIB-IMRT technique and the RPM system (Varian) for respiratory motion management. For pre-treatment verifications, we recorded ionization chamber measurements and treatment planning system calculations (Eclipse; Varian) both for per-beam and integral dose at the measurement point. We also measured the time it took to perform the verifications. For each radiation field, the physicist selected 2 representative points at high and/or homogeneous fluence regions. We recorded the coordinates of these points and corresponding calculated entrance doses. Entrance dose IVD was performed

by placing 2 QED diodes (Sun Nuclear) on the patients' skin at the aforementioned points. To ensure accurate positioning, we attached a template to the linac collimator using an add-on. This template, by means of the light field, projected a 1 cm square grid (at isocenter) on the patients' skin (figure 1a). We compared *in vivo* measurements collected by DPDpc (IBA) to entrance doses calculated by Eclipse. We repeated this process for each radiation field except those whose light field was shaded by the treatment couch. We also recorded the additional time taken to perform IVD measurements.

Results

Table 1.

Technique (→) (↓) Comparison	Pre-treatment verification	IVD measurements
(a) Per beam accuracy	11.8%	26.3% (per diode) 15.3% (both diodes)
(b) Per patient accuracy	1.1%	3.4%
(c) Speed	45 min	10 min
(d) Exhaustiveness (threshold)	68% (0.05 Gy)	67% (0.2 Gy)

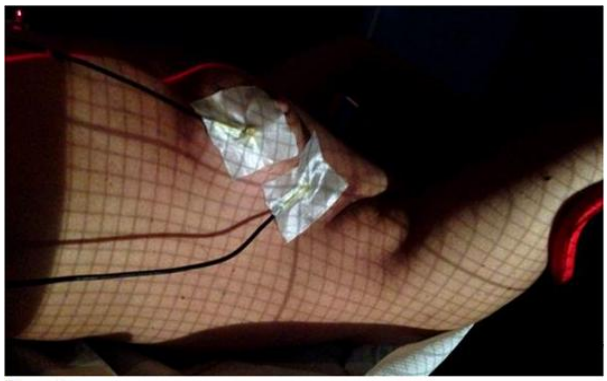

Figure 1a

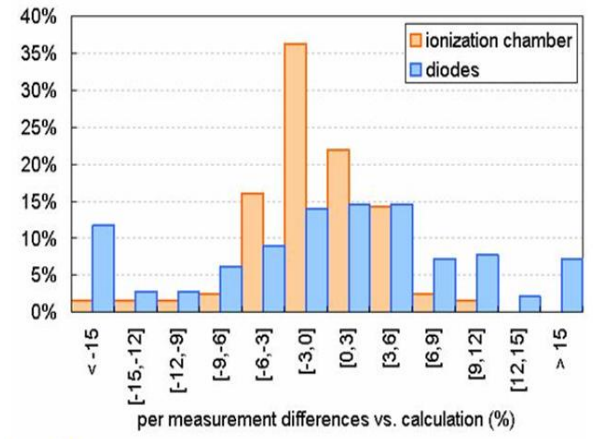

Figure 1b

Figure 1b shows the differences between per beam measurements and calculations both for pre-treatment verifications and IVD measurements.

Table 1 compares pre-treatment verifications and IVD measurements in terms of: (a) per beam accuracy, defined as the 95th percentile of differences between individual measurements and calculations; (b) per patient accuracy, defined as the standard deviation of: differences between measured and calculated integral doses for pre-treatment verifications; and averages of all differences between diode readings and entrance doses for IVD; (c) speed, defined as the additional time required per patient; (d) exhaustiveness, defined as the percentage of radiation fields that provide significant dose contributions at measurement points (>0.05 and >0.2 Gy for ionization chamber and diodes respectively).

Conclusions: IVD using diodes presents larger uncertainties than pre-treatment verifications using ionization chambers. Two diodes per field are needed to minimize uncertainty to acceptable levels. However, IVD assesses more radiation fields than pre-treatment verifications based on one-point measurements fixing the same dose threshold, and is globally more time efficient. This work was funded by a grant from the Barcelona Board of the Spanish Association Against Cancer (AECC) 2012.

EP-1641

Effectiveness of dose reduction in rectum for prostate cancer using helical radiation in Tomotherapy

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Purpose/Objective: We should reduce rectum dose for side effects in Radiation therapy. We have developed a dummy structure in PTV .We have carry out this method in clnical data alredy.The overall aim of the study was to reduce high dose in rectum at the prostate cancer therapy in Helical therapy at Tomotherapy system. As many authors have reported that rectal hemorrhage important factor in high dose in rectum. We have come to expect good results.

Materials and Methods: As first. We experimentally compared optimizing of using a dummy structure to no dummy structure. Dummy structures size were 3mm,5mm,7mm,9mm. The fundamental study, it's were assessed using DVH(Dose volume histogram,76Gy,75Gy, 70Gy,60Gy,50Gy,40Gy,30Gy) that was rectum dose in water equivalent phantom. and Structures of PTV ,Prostate,bladder and rectum from TG119(AAPM Task group 119) were used for the experiments and then these were optimized each of 10 times using TPS(planning station).The systems used in this experiment were discussed below. As a next step.We performed a retrospective cohort study of patients with prostate cancer. The subjects of the present study are 10 patients that we experienced in our department between May 2014 and September 2014.We used as a control simulation Data of each patients without dummy structure in PTV.

1,Tomotherapy planning station 2,MIM Maestro Ver 6.2.3 3,SPSS Statistics Ver 22.