and NTD90, rep.). NTD parameter was evaluated in a virtual structure consisting of an adjacent tissue shell surrounding the target volume by adding a 1 cm margin. A two tailed Student t-test (α= 0.05) was performed for comparison of each parameter.
**Results:** Small differences were found between the two MLCs for the average values of the dosimetric parameters analysed: $CI_{STD}$= 1.45 *vs* $CI_{HD}$= 1.41 (p= 0.119); $G_{STD}$=5.8 mm *vs* $G_{HD}$= 5.6 mm (p< 0.0002) ; $V12_{STD}$=5.77 cc *vs* $V12_{HD}$= 5.49 cc (p< 0.02); $NTD50_{STD}$= 43.41 cc *vs* $NTD50_{HD}$= 41.16 cc (p< 0.01); $NTD70_{STD}$= 22.62 cc *vs* $NTD50_{HD}$ = 21.19 cc (p<0.002); and $NTD90_{STD}$= 9.52 cc *vs* $NTD90_{HD}$= 8.84 cc (p< 0.02).
**Conclusions:** While the 2.5 mm HD MLC gives slightly better values than the 5 mm MLC for all parameters analysed, the differences seem clinically not relevant.

**PO-0808**
**Dosimetric impact of extended 16-bit depth CT images for helical irradiation with metallic implants**
S. Chiavassa[1], G. Delpon[1], S. Josset[1], C. LLagostera[1], C. Dupuy[1], M. Voyeau[1], A. Lisbona[1]
[1]*ICO, Physic Department, Saint-Herblain, France*

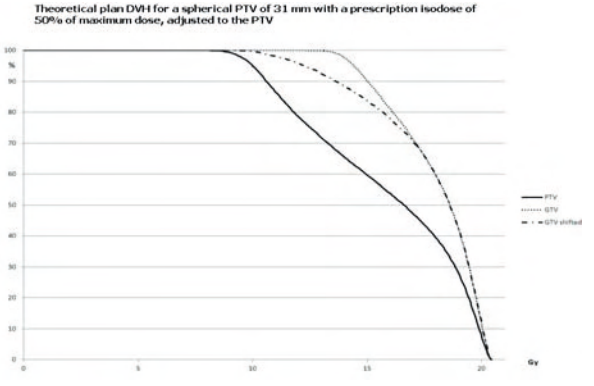
**Purpose/Objective:** The use of 16-bit depth scanner images (CT) for dose calculation in radiotherapy allows considering the density of high-Z material, while12-bit depth CT saturates. The aim of this study is to evaluate the dosimetric impact of metallic implants considering 12 and 16-bit CT images, for helical treatments. Pelvic, Head and Neck and prostheses irradiations are considered.
**Materials and Methods:** Dosimetric calculations were performed withTomoTherapy® planning software (voLO™). Extended CT to physical density curve (CT-PD) was derived from tissue characterization phantom with Titanium insert (7200 ± 90 HU , 4.59 g/cc). TomoTherapy® planning software extrapolates linearly the CT-PD curve for HU numbers above the maximum point of the curve. Ten patients were considered for each of the 3 localizations. For each patient, an extended (16-bit) and non-extended (12-bit) version of the same CT were reconstructed. Artifacts in soft tissues due to metallic implants were manually corrected. Moreover, as reference, a metal-free CT was created for each patient by replacing metallic densities with bone, teeth or soft tissue densities. For helical irradiation, all gantry angles were allowed. Number of Monitor Unit (MU), dose distribution andHistogram-Dose-Volume (HDV) were compared.
**Results:** For 12-bit CT, metallic implants saturates at 3071 HU (2.68 g/cc), while for 16-bit CT, range CT numbers were [7000-16500 HU](i.e. [4.76 – 9.51 g/cc]) and [5000-31700 HU] (i.e. [3.76 – 17.11 g/cc]) for hip prostheses and metallic dental filling, respectively. For Head and Neck and pelvic helical irradiations, no significant differences were observed for MU and dose distribution, between calculation from 16-bit, 12-bit and metal-free CT. For prostheses irradiation, MU calculation from 12-bit depth CT and metal-free CT are similar, while calculation from 16-bit depth CT increased MU calculation more than 5%.
**Conclusions:** Real physical densities of metallic implants such as prosthese sand dental filling are much higher than maximal density of 12-bit depth CT images. However, for helical treatment, due to the important number of projections, metallic implants such as prostheses and dental filling have a negligible impact on dose calculation for non-metallic targets. Therefore, avoiding metallic structures is not necessary allowing a better target-dose conformity and organ-at-risk sparing. On the contrary, for metallic irradiation, the use of non-saturated images increases significantly MU calculation (>5%). However, the extrapolation of CT-PD curve and accuracy of algorithms in high densities medium should be investigated. Modification in practice for metallic targets should be considered carefully.

**PO-0809**
**A plea for the GTV median dose reporting in SBRTCan the ICRU 83 reporting way be applied to SBRT plans?**
T. Lacornerie[1], E.F. Lartigau[2], N. Reynaert[1]
[1]*Centre Oscar Lambret, Medical Physics, Lille, France*
[2]*Centre Oscar Lambret, Radiation Therapy, Lille, France*

**Purpose/Objective:** In 2008 Papiez and Timmerman have written: *'The main obstacle for safe application of the SBRT (...) is the unavailability of data that allow unambiguous determination of the parameters for fractionation schemes and dose prescriptions.'* Plan comparison is difficult with various prescriptions (80% of maximum dose, on the 70% or 50%), a large variety of indexes are used (conformity, gradient …). Furthermore in clinical studies, only one dose is reported most of the times which does not permit to precisely describe the dose distribution. In 2010 the report of AAPM TG 101 suggests to report SBRT with *'prescription ICRU reference point or dose/volume e.g., isodose covering PTV to a particular percentage,(…), plan conformity (…), heterogeneity index (…)'*. At the same time ICRU report 83 for IMRT was published, because of inherent heterogeneities of IMRT plans the ICRU point is abandoned and prescription is based on median target dose. Can we conciliate these 2 reports?
**Materials and Methods:** Theoretical plans with Cyberknife, in anthropomorphic phantom, for spherical GTV of 2, 3, 4 and 5 mm with a PTV margin of 1 mm were created with prescription of 10 Gy on 74%, 65%, 54% and 47% of maximum dose respectively, perfectly adjusted to cover 95% of PTV. GTV median doses were collected. Plans with a shift equal to the PTV margin, in the direction of the minimum observed in the dose distribution, were created and the GTV median doses were again collected. The same exercise was made with GTV of 21, 23, 25, 27 mm and a PTV margin of 2 mm. And again with GTV of 57, 59, 61, 63 mm and a PTV margin of 3 mm. 3 different clinical situations: brain metastases, prostate and lung lesion were assessed with different percentage of maximum dose used for prescription and again applying a shift.
**Results:** The GTV median dose is little sensitive to the minimum in the PTV, and thus remains almost constant with the shift of the isocenter in all cases i.e. when we imagine a systematic error equal to the PTV margin. With the 6 mm PTV and a prescription isodose of 54%, i.e. with a fall-off of 20%/mm at the edge of the PTV, the GTV median dose is 14.77 Gy and 14.75 Gy with the shift. For the particular case of lung where the PTV includes a low density region, using Monte-Carlo calculation, the GTV median dose is also stable with the shift. In case of a steep dose gradient, even with heterogeneity, the GTV median dose is stable when the GTV moves within the PTV. Using the GTV median dose we have a good description of the actually dose delivered.

Theoretical plans with a PTV margin of 2 mm

| | | | | |
|---|---|---|---|---|
| PTV diameter (mm) | 31 | 29 | 27 | 25 |
| GTV diameter (mm) | 27 | 25 | 23 | 21 |
| prescription isodose in % of max PTV D95% = 10 Gy | 49% | 59% | 71% | 81% |
| GTV median dose (Gy) | 17,9 | 15,4 | 13,2 | 11,7 |
| GTV median dose (Gy) with a shift | 17,9 | 15,4 | 13,3 | 11,7 |
| differences | 0,0% | 0,0% | 0,1% | 0,0% |




**Conclusions:** The GTV D50% appears to be a convenient way to describe the dose distributions, whatever the % of maximum dose used for prescription, and may help for treatment comparison in SBRT. For a better understanding of the dose distributions, every team should report PTV D98%, PTV D95%, PTV D2% and GTV median dose like ICRU report 83 recommends for IMRT, in order to compare clinical studies.

**PO-0810**