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Tomotherapy implementation and integration in RayStation: one year-experience.

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Introduction: To report about the Tomotherapy implementation and integration in RayStation Treatment Planning System (TPS) version 8a. This new mixed system involved the planning with Raystation and then the export of treatment plans to iDMS, a single database provided by Accuray common for both machines.

Materials and Methods: Two Tomotherapy units were commissioned in November and December 2018, respectively. Machine models imported in RayStation were expected to comply with the gold standard models unless minor adjustments of the calculated output factors for each field width. Machine models were dosimetrically validated via in-phantom measurements of plans designed for each field width and for both techniques, TomoHelical and Tomo Direct, by means of A1SL ionisation chamber. In addition, a variety of clinical Tomotherapy-based plans designed with RayStation was checked using the PTW Octavius system. Furthermore, any difference observed with respect to the previous system (i.e. Accuray only, both TPS and database) in its clinical use was also registered and herein reported.

Results: Adjustments in the output factor were observed $< 1\%$ ranging between 1 and 1.01 for one machine and 0.995 and 1.006 for the second one. With such parameters set in the machine models, difference between calculated and measured dose was observed less than 1.5% as maximum and less than 0.5% in average. Clinical plans were successfully delivered having a gamma pass index $> 97\%$ with 3%/3mm criteria. Several differences were observed when comparing the clinical use with the previous clinical implementation: 1) Machine maintenance could cause a discrepancy between the model existing in the TPS and the one in iDMS avoiding treatment unless remodelling the machine in RayStation. 2) After a number of times (> 80), plans QA could not be longer exported to iDMS unless changing their DICOM properties. 3) Treatment plans having low (0.5 Gy) prescription doses must be planned using a machine model encompassing the full range of leaf-open-time (LOT) and not only limited to 60ms as pre-configured in RayStation. 4) Treatment plans requiring all the leaves of the MLC working simultaneously required more additional planning time to fulfil the mechanical limits of the machine. 5) Patients transfer between machines was not available in this current version of the TPS.

Conclusion: The commissioning of both machines in RayStation was straightforward with no complications. On the other hand, the integration between the version 8a of the TPS and iDMS suffered from several pitfalls, which could have a significant impact on the clinical routine.

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