BELdART: Belgian Dosimetry Audits in RadioTherapy

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Purpose: Independent dosimetry audits are crucial for the QA of radiotherapy departments. The Nuclear Technology Centre (NuTeC) is performing dosimetry audits since 2009 in Belgium and occasionally in some neighbouring countries. The BELdART project started when the Belgian Federal Agency for Nuclear Control (FANC/AFCN) requested a national audit program for reference and non-reference conditions with support from the Cancer plan. During 2009-2011, all Belgian clinics participated in the dosimetry audits for standard static fields. Then in 2012, auditing of more sophisticated techniques was introduced such as IMRT, Arc therapy and Tomotherapy. In 2017, an audit program for intracranial SRS was developed and later for lung SBRT early in 2020. Additionally, NuTeC also provides external audits upon request from the clinics.

Materials and Methods: A combination of alanine/EPR and film dosimetry is used for the dose measurements, the alanine being used for point dosimetry and the film for evaluating 2D dose distributions. The audits are composed of basic dosimetric checks in water and solid water with alanine pellets and End-To-End (E2E) tests on an anthropomorphic phantom containing film/alanine detectors. The films are analysed with 3-channel dosimetry. All measurements for a beam are performed on the same day to allow identifying the source of possible problems during the E2E test. Since 2012, the audits are entirely mailed.

Results: 61/91 machines were audited during 2009-2011 with 60/61 of the machines having acceptable parameters and for the dosimetric evaluation, all the 212 beams were within 5%. During 2012-2016, 33 beams were audited for IMRT/Arc treatment on a prostate case. 87.9% and 78.8% of the beams were within 3% for the alanine pellets placed in the prostate and seminal vesicles regions respectively. For the gamma analysis with the films with 3%/3mm criteria, 97% of the films had a passing rate higher than 95%. For the intracranial SRS audits, 16 beams were audited up to now with 68.8% of the beams being within 3% for the alanine measurement. For the films with 5%1mm criteria for the gamma analysis, 15/16 had a passing rate higher than 90%. 2 lung SBRT audits are performed at the time of writing.

Conclusions: The BELdART team continues to provide dosimetry auditing services to the radiotherapy community in Belgium. The results up to now show that in general, the dosimetric accuracy in Belgian clinics is very good for the different audited techniques.

Keywords: dosimetry audit, alanine/EPR dosimetry, film dosimetry

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