Optimisation, verification & validation of transit dosimetry Mathilde Croisé¹, Sofia Celi¹, Fabien Lebeaux², Pascal François¹

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In radiotherapy, the complexity of modern treatment techniques requires advanced quality assurance controls. Since 2011, the in vivo dosimetry (IVD) verification is mandatory in France. It consists of a measurement during the patient treatment to control if the delivered dose is in line with the planned dose. Several methods are used to performed IVD:

detectors (diode, thermoluminescent dosimeter, mosfet): the delivered dose inside the patient is the average of the dose picked up by two detectors fixed on the patient skin, at the input and the output of the beam.

transit dosimetry: the delivered dose inside the patient is a mathematic reconstruction of the dose transmitted on a electronic portal imaging device (EPID) embedded on the linear accelerator.



Figure 1: distribution of the dose difference between transit and planned dose for 173 controls

In volumetric modulated arc therapy technique (RapidArc), a systematic discrepancy of about -3% is observed between the transit dose and the planned dose. The goal is to investigate the source of this discrepancy while checking both doses with the help of several softwares and detectors.



RESULTS



CONCLUSION

The Compass calculation is similar to the Eclipse calculation with a **0,09%** of dose difference in average. Both calculations give the same planned dose while using different algorithms. As the planned dose has been double checked, the discrepancy of -3,16% may result from the EPIgray calculation.

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The Compass measurement is close to the Eclipse calculation with a **-1,46%** of dose difference in average. However, the Compass measurement approaches the EPIgray calculation: almost half of the dose difference is due to the beam delivery.



Under a uniform beam, the ion chambers of the MatriXX give all the same dose response whereas the EPID dose response decreases from the center to the edge of the EPID surface. The EPIgray calculation may be distorted because of this **non constancy** of the EPID dose response.

The mean dose difference between the EPIgray calculation for patient irradiations on the cheese phantom

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