Framework for out-of-field dosimetry in photon radiotherapy: application to Hodgkin lymphoma

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Background

The improved outcome of radiotherapy (RT) treatments raises the awareness of long terms effects, such as secondary cancers. This is of special interest for young patients, treated with a curative intent, a group where classical Hodgkin lymphoma (cHL) is common.

Purpose

The objective of this work is to present the implementation of a framework for cHL patients to evaluate the out-of-field doses related to secondary cancer risk.

Materials

- ✓ The framework (Fig. 1) consists of 2 integrated Matlab-based programs to process the dicom files of a RT plan exported from the TPS:
  - ○ **IS²aR** (1) generates a virtual whole-body CT phantom using the original CT of the patient
  - ○ **P3D** (2) evaluates peripheral photon dose in the virtual phantom from the number of MU, the prescription dose, the mean field size (from 50% isodose) and the out-of-field area (defined from the 5% isodose).
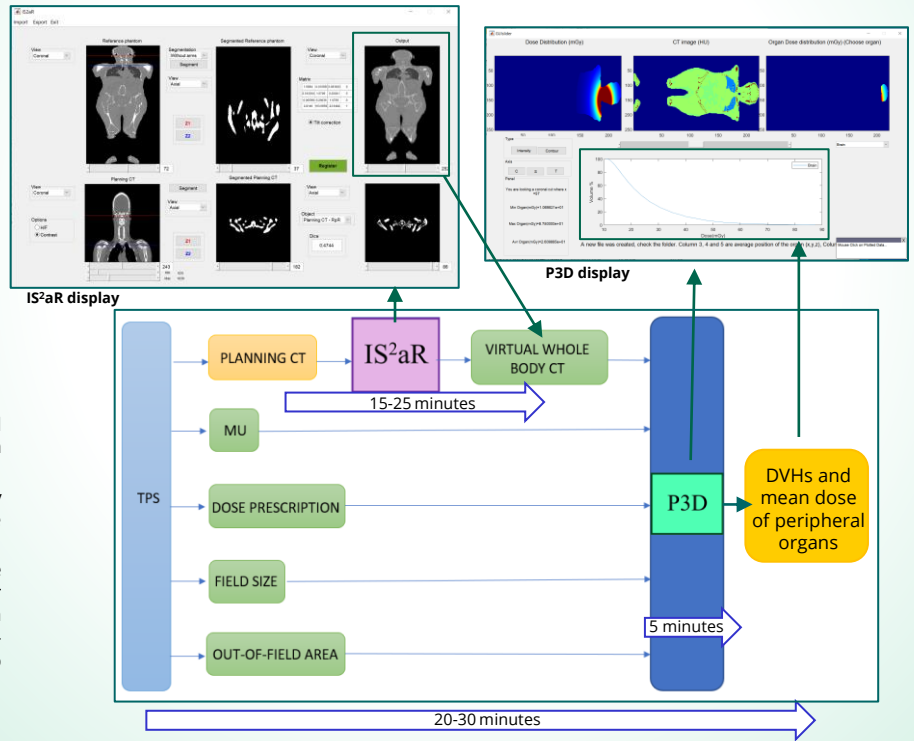- ✓ The system was tested in cHL patients, treated with VMAT.

IS²aR display

P3D display

Figure 1. Framework and execution times.

cHL Results

Organ	Mean dose per target dose (mGy/Gy)	
	Target in neck area	Target in thorax area
Brain	14	4
Oesophagus	23	42
Lungs	10	37
Stomach	1.7	11
Liver	1.7	10
Colon	0.18	0.65

Conclusions

- ✓ The system provides organ doses within about 30 minutes per patient.
- ✓ DVHs provided by the computation platform can be subsequently used for secondary cancer risk estimations.

References

1. Rad. Oncol. 2022;170:S1341-S1342. **2.** Front.Oncol. 2022;12:872752