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Time resolved imaging

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Time resolved imaging

In the last years, particle radiotherapy has attracted increasing interest for the treatment of moving organs, such as pancreas, liver and lung, and promising outcomes have been obtained with proton and carbon ion radiotherapy. Indeed, particle beams present favourable physical properties, allowing conforming the dose to the target while sparing surrounding healthy tissues, and offer increased radiobiological effectiveness with respect to X-ray radiotherapy. However, thoraco-abdominal tumours are subject to motion due to respiration, which causes target displacement and radiological path length changes, resulting in particle dose distribution variations. If not accurately accounted for, these variations can hinder treatment accuracy and efficacy. Different treatment solutions have been proposed, such as breath-holding, respiratory gating, being the optimal solution in terms of patients' compliance and technical effort, and tumour tracking, which is not yet clinically implemented in particle therapy. These treatment solutions however require accurate image-guidance techniques to plan, adapt and verify the treatment, with Computed Tomography (CT) and time-resolved 4-Dimensional (4D) modality being the current clinical standard. In this presentation, we will review the basic concept of time-resolved imaging adopted within the current clinical practice, along with novel time-resolved imaging techniques which could improve respiratory motion quantification and management in particle therapy.

Summary

Presenters: BARONI, Guido (Politecnico di Milano); BARONI, Guido (Politecnico di Milano)