OR-Imaging

1. Ortho CT (Orthogonal Computed Tomography for X-Ray Therapy)
2. O-PGI (Orthogonal Prompt-Gamma Imaging for Proton Therapy)
3. TPPT (In-Beam TOF-PET for Proton Therapy)

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OR Imaging: SWOT analysis

Strengths

The rotation-free, low-dose imaging capability of O-PGI and OrthoCT are two of their strengths. The imaging capability of both techniques have been proven by experiment (OrthoCT) and detailed simulation (O-PGI) in real therapeutic scenarios. O-PGI competes with in-beam time-of-flight PET, the latter highly suffering from biological washout of the produced beta+ activity, which does not affect O-PGI.

Weaknesses

The high out-of-field particle flux existing in a clinical linac force OrthoCT to be surrounded by heavy shielding. This weakness can be surpassed by proper robotic solutions to position the whole detector assembly closer to the patient; nevertheless, they come at non-negligible price. Both O-PGI and in-beam PET suffer from their complexity of detector positioning.

Opportunities

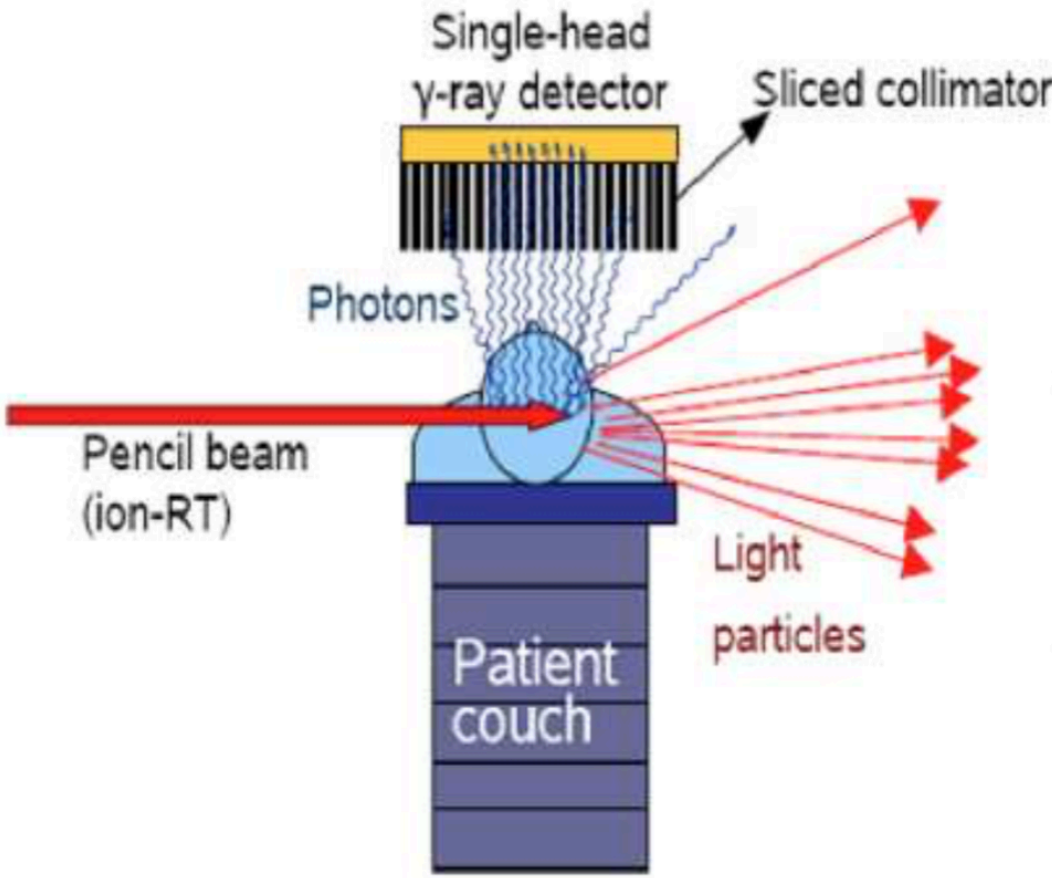
The higher the degree of conformality achievable by means of external beam radiotherapy, the equally higher is the demand for patient imaging just prior (on- board) or during the therapy session, in order to ensure that the high conformal capability of the treatment is reaching its goals (tumor irradiation, sparing of organ(s) at risk or healthy tissue). The three techniques researched in our group represent an added value in both scenarios: on-board and/or real-time patient imaging.

Threats

The investment of clinical sites in other IGRT (image-guided radiation therapy) techniques makes investment in the three pursued techniques questionable for such sites, at least before the return on previous investment(s) is achieved.

OR Imaging: the concepts

OrthoCT and O-PGI:



TPPT: