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## Purpose or Objective

Radiotherapy (RT) has been characterized by rapid development and adoption of novel technologies often prior to any robust clinical evidence of its value. Incorporation of magnetic resonance (MR) to the RT paradigm is a recent technological advance as demonstrated with the MR-Linac (MRL). MRI allows improved soft tissue definition and contrast, which may enable adaptive treatment strategies including daily re-planning. We quantitatively compared adaptive strategies within MRL systems, and benchmarked against current state-of-the-art volumetric image-guided RT in SABR for localized prostate cancer (PCa).

Five fraction SBRT was delivered every other day, using adapt-to-shape (ATS) workflow within a commercial MRL (Elekta Unity). Targets and OARs were re-contoured on MR images acquired during RT delivery ('beam on'). For each fraction, different adaptive strategies were applied (ATS re-planning, adapt-to-position based on complete 3D structure information [ATP] and adapt-to-position based on FM only [CBCT-like]) and compared quantitatively based on dosimetric parameters.

No difference ( $p > 0.05$ ) in delivered doses to target and OARs were observed between CBCT-like and ATP strategies. ATS re-planning showed no difference compared to CBCT-like and ATP in total delivered dose ( $p > 0.05$ ) as well on each fractional delivered dose ( $p > 0.05$ ).

## Materials and Methods

Eligible patients included those undergoing radical radiotherapy as part of prospective clinical trials of MR-guided dose-escalation for PCa. Prior to planning imaging, all patients underwent transperineal insertion of 3 intra-prostatic fiducial markers (FM). Simulation imaging sets included: 3-Tesla multiparametric MR with and without endorectal coil (ERC), and computed tomography (CT). CTV (prostate only) and OARs (bladder and rectum) as whole organs were delineated as per protocol.

## Results

Five patients with a total of 23 fractions were analyzed. Prostate volumes and deformation did not differ significantly between each fraction on each patient (maximum prostate volume change 3.5%). All planned and delivered doses to target and OARs were within pre-determined Institutional constraints and were independent of the adaptive strategy. Differences in translations between CBCT-like and ATP were within a margin of 1mm in all axes.

## Conclusion

We provide unique clinical data that quantifies the role of on-line MR guidance and adaptation strategies for PCa SABR. ATP based on MR-guidance seems comparable to CBCT-like image-guidance, but obviates the need for FM. Conversely, ATS re-planning does not appear superior to MR-guided ATP or FM-based image-guidance. Further studies may be needed to assess potential subset of patients who may benefit from more resource-intensive ATS re-planning in SABR for PCa