Purpose: HybridArc is a novel treatment technique blending aperture-enhanced dynamic conformal arcs with discrete IMRT beams, allowing selection of dynamic arcs with a set of static IMRT beams at specified intervals along each arc. The aim was to evaluate the new technique with regard to achievable plan quality and treatment efficiency and to compare HybridArc against the well establish IMRT treatment technique, Tomotherapy, for the preoperative treatment of rectal cancer.

Methods: Twelve patients treated with Tomotherapy were considered and simulated with HybridArc. Treatment plans were designed to deliver in one process a homogeneous dose of 46.0Gy with an integrated boost of 55.2Gy. Planning objectives were to give at least 95% of the prescribed dose to 95% of the PTVs while keeping irradiated volumes of the organs-at-risk (small bowel and bladder) as low as possible. The gradient toward the boost region (GI) (ratio volume receiving 52.5Gy on PTV55.2Gy volume), the volumes receiving: 95% of the dose for PTV, 15Gy (V15) for small bowel and 21Gy (V21) for bladder were analyzed.

Results: All plans achieved the objectives. Comparable GI was found 1.31 SD0.20 (HybridArc) and 1.32 SD0.16 (Tomotherapy). The 95% PTV coverage was 95.70% (SD1.16) and 97.80% (SD1.70) for PTV46Gy ; and 99.19% (SD1.60) and 99.29% (SD0.72) for PTV55.2Gy for HybridArc and Tomotherapy, respectively. In terms of organ at risk sparing, a small advantage for Tomotherapy was found. The V15 of the small bowel was 145.90cc (SD75.94cc) and 112.71cc (SD73.43cc), for HybridArc and Tomotherapy, respectively. The V21 for the bladder was 45.48% (SD10.19) and 39.68% (SD10.67), for HybridArc and Tomotherapy, respectively.

Conclusions: HybridArc is clinically possible for the irradiation of preoperative rectal cancer. Furthermore, HybridArc, using one single enhanced dynamic conformal arc and 6 discrete IMRT beams, can achieve equivalent treatment plans (PTV coverage and organ at risk sparing) than the Tomotherapy.