

# Magnetic Resonance Image Guided Radiation Therapy Using ViewRay Technology Including On-Table Adaptive Planning – A Novel Radiation Approach to Treatment of Intra-Abdominal Tumors

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## Abstract

Statement of the Problem: Image-guided stereotactic radiotherapy (SBRT) of intra-abdominal tumors is a special challenge due to respiratory motion and close proximity of critical normal structures. A novel technology combining magnetic resonance imaging with a linear accelerator (MR-linac) allows for superior soft tissue contrast resolution, ability for real-time image-guided treatment delivery with tumor tracking, as well as on-table adaptive planning. The purpose of this study is to describe our two-year experience using the MR-Linac for radiotherapy of intra-abdominal tumors.

## Methodology & Theoretical Orientation

Treatment data from patients with intra-abdominal tumors treated on the MR-linac since July 2017 were reviewed. Doses ranging from 21 Gy in 3 fractions to 50 Gy in 5 fractions were given, depending on the site. CT and MR simulations were performed prior to treatment in the free-breathing, end-exhalation, and end-inhalation breath-hold positions to determine patient tolerability and potential dosimetric advantages. Respiratory gating was performed using sagittal cine images acquired at 4 frames/second. Standard OAR constraints were used for optimization. On-table adaptation was used in selected cases, with on-table re-contouring of the organs at risk, dosimetry plan mitigation, and generation of an adaptive plan. The changes between the original plan and the adaptive plan were assessed and a determination were made whether to go with the original or the adapted plan.

## Conclusion & Significance

SBRT treatment of intra-abdominal tumors using a gated technique on a MR-Linac has been successfully implemented and demonstrates potential for delivery of higher doses, with tighter margins, thus reduced toxicity with potential for increased tumor control. The on-table adaptive planning offers further risk reduction to normal tissues. Further follow up and data acquisition are needed to evaluate if this will translate to better tumor control and survival benefit.

## Article Information

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