INTRODUCTION

The aim of our study was to further evaluate the potential role for proton therapy in the management of locally-advanced carcinoma of the rectum with respect to minimizing dose to relevant normal tissue structures including the bladder, bones, and bowel, through direct dosimetric comparisons with 3DCRT and IMRT techniques.

METHODS

Patient Demographics:
- 10 patients with T3 adenocarcinoma of the rectum

Targets:
- Clinical target volume (CTV)- gross tumor and involved lymph nodes, mesorectum, presacral and internal iliac lymph node regions, with appropriate margin (RTOG consensus contouring atlas)
- PTV: CTV + 7mm

Prescription:
- 45 CGE in 1.8 CGE/fraction

3D-CRT treatment plans:
- 18-MV photons
- Beams: R.t Lat., Lt Lat., PA

IMRT treatment plans:
- 6-MV photons with Millennium 120 MLC
- Beams: 0, 40, 70, 95, 265, 290, and 320

Proton Treatment Planning:
- Eclipse version 8.917m (Varian Medical Systems)
- Beams: R.t Lat., Lt Lat. (50/50)

Range Uncertainties:
- Proximal/Distal Margin- CTV nominal range + 3.5% + 3mm
- PTV used for lateral margins

Statistical Analysis:
- HI was expressed as (D_{95} - D_{50}) / prescription dose.
- CI was expressed as the ratio of the absolute volume receiving the prescription dose to the volume of the target, V_{15Gy} / V_{PTV}
- Paired, two-tailed Wilcoxon signed-rank test, with p-value < 0.05

Rectal Air Uncertainties:
- With and without the rectal air overridden plans generated
- The primary was the plan without the gas override.

RESULTS

- Mean Dose: Protons statistically better for all structures.
- Protons significantly improved the V_{15Gy} for the bladder, femoral heads, pelvic bones, sigmoid/colon except the small bowel.

CONCLUSIONS

- Proton Therapy compared to 3DCRT and IMRT yielded plans with similar target coverage, homogeneity, and conformity, while significantly lowering dose to all of the adjacent organs-at-risk for the treatment of Rectal Cancer.

REFERENCES