

«COMPARATIVE BETWEEN IMRT AND 3D-CRT FOR UPPER GI MALIGNANCIES»

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INTRODUCTION

Adjuvant therapy after surgery in patients diagnosed with tumors of the upper abdominal area is a standard of care. In the field of radiotherapy is a challenge for proximity to PTV of multiple OARs including spinal cord, liver, kidneys, lungs or heart. Our goal of this study is to demonstrate the benefit of IMRT over 3D-CRT on OAR protection and improvement in PTV coverage.

MATERIAL AND METHODS

11 patients were selected with upper digestive tract neoplasms with adjuvant treatment indication. The 3D-CRT technique involved two lateral fields and one or two oblique, with different table angles to avoid most volume of kidneys. IMRT technique involved several multi-field coplanar inverse planning. The prescription dose was 45 Gy in 25 fractions. HDV, dose homogeneity and dose to OAR were evaluated.

RESULTS

Both techniques are adequate with good coverage in the V95 with no evident differences in PTV dose homogeneity. IMRT was superior to 3DCRT with improvements in reducing the volume of both kidneys in the low dose region (V15) and liver as well (V30), achieving a lower spinal cord maximum dose. This can be explained by more number of the beams used in the IMRT technique. However, there were no significant improvements in PTV coverage.

| | | Patient 1 | Patient 2 | Patient 3 | Patient 4 | Patient 5 |
|--------------|------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| | | 3D / IMRT | 3D / IMRT | 3D / IMRT | 3D / IMRT | 3D / IMRT |
| PTV | Mean Dose | 45.5 Gy / 45 Gy | 45.2 Gy / 45.2 Gy | 44 Gy / 44.7 Gy | 45.2 Gy / 44.9 Gy | 45.5 Gy / 45.3 Gy |
| | V_{95} | 99.5% / 99.2% | 98.5% / 98.12% | 98.3% / 99.1% | 99.03% / 98.5% | 99.7% / 98.7% |
| | D_1 | 107.5% / 101.9% | 106.5% / 104.4% | 104.4% / 103.4% | 105.8% / 103.1% | 106% / 105.2% |
| | D_{99} | 96.1% / 95.8% | 94.9% / 94.4% | 94.6% / 95.7% | 95.2% / 97% | 96.1% / 94.3% |
| Spinal Cord | D_{\max} | 30.8 Gy / 21.3 Gy | 28 Gy / 17.8 Gy | 25.9 Gy / 17.3 Gy | 30.2 Gy / 17.1 Gy | 17.2 Gy / 18.4 Gy |
| Right Kidney | Mean Dose | 9.3 Gy / 9.8 Gy | 3.1 Gy / 4.2 Gy | 11 Gy / 9.7 Gy | 4.5 Gy / 8.1 Gy | 1.5 Gy / 2.1 Gy |
| | V_{15} | 20.2% / 10.6% | 0.1% / 0% | 27.8% / 14.1% | 4.1% / 15.4% | 0% / 0.1% |
| Left Kidney | Mean Dose | 11.7 Gy / 13.7 Gy | 10.1 Gy / 11.3 Gy | 8 Gy / 11.4 Gy | 8.9 Gy / 7.2 Gy | 13.8 Gy / 12.1 Gy |
| | V_{15} | 30.6% / 9.9% | 24.6% / 0.91% | 17.4% / 15% | 34.1% / 14.7% | 31.9% / 31.6% |
| Liver | Mean Dose | 13.1 Gy / 17.1 Gy | 14.6 Gy / 11.7 Gy | 14.4 Gy / 13.8 Gy | 20.4 Gy / 20.2 Gy | 13.6 Gy / 11.2 Gy |
| | V_{30} | 14.3% / 9.9% | 9.6% / 8.4% | 5.3% / 9.7% | 23.1% / 22.6% | 8.3% / 4.5% |

| | | Patient 6 | Patient 7 | Patient 8 | Patient 9 | Patient 10 | Patient 11 |
|--------------|------------------|-------------------|--------------------|-------------------|-------------------|-------------------|-------------------|
| | | 3D / IMRT | 3D / IMRT | 3D / IMRT | 3D / IMRT | 3D / IMRT | 3D / IMRT |
| PTV | Mean Dose | 45.5 Gy / 44.8 Gy | 45.7 Gy / 45.5 Gy | 45.7 Gy / 45.5 Gy | 45.9 Gy / 45.2 Gy | 45.3 Gy / 44.7 Gy | 44.8 Gy / 46 Gy |
| | V ₉₅ | 98.5% / 99.2% | 99.6% / 98.7% | 99% / 98.7% | 99.2% / 98.6% | 96.7% / 96.8% | 95.1% / 96.2% |
| | D ₁ | 106.5% / 102.9% | 106.6% / 107% | 106.2% / 107% | 106.9% / 106.7% | 105.8% / 102.3% | 104.6% / 109% |
| | D ₉₉ | 94.6% / 95.8% | 95.9% / 95.1% | 95.1% / 95 | 95.4% / 94.6% | 91% / 91.8% | 88.6% / 88.9% |
| Spinal Cord | D _{máx} | 36 Gy / 20.2 Gy | 12.2 Gy / 18.3 Gy | 15.3 Gy / 18.3 Gy | 31.5 Gy / 21.8 Gy | 15.1 Gy / 20.3 Gy | 44.8 Gy / 40.2 Gy |
| Right Kidney | Mean Dose | 1.6 Gy / 4.4 Gy | 7.6 Gy / 7.1 Gy | 7.9 Gy / 7.1 Gy | 2.2 Gy / 7.8 Gy | 6.7 Gy / 10.5 Gy | 13.4 Gy / 12.8 Gy |
| | V ₁₅ | 0% / 2.2% | 2.1% / 0.9% | 20.1% / 0.94% | 0% / 0.5% | 9.9% / 13.4% | 31.6% / 24.3% |
| Left Kidney | Mean Dose | 7.3 Gy / 8.9 Gy | 14.1 Gy / 12.9 Gy | 11.7 Gy / 12.9 Gy | 12.3 Gy / 12.4 Gy | 13.2 Gy / 11.9 Gy | 13.4 Gy / 13.7 Gy |
| | V ₁₅ | 18.8% / 19.4% | 30.1% / 15% | 32.8% / 15% | 34.5% / 19.8% | 28.8% / 15% | 31.6% / 18.5% |
| Liver | Mean Dose | 14 Gy / 16.8 Gy | 22.3 Gy / 15.22 Gy | 18 Gy / 15.2 Gy | 20.8 Gy / 18 Gy | 20.3 Gy / 17.8 Gy | 17.9 Gy / 22 Gy |
| | V ₃₀ | 11.4% / 10.15% | 32.3% / 9.6% | 20.8% / 9.6% | 18.6% / 13.3% | 29.7% / 11.7% | 19.8% / 24.3% |

CONCLUSION

IMRT is a recommended technique for better protection of organs at risk without improving PTV coverages for upper GI malignancies.