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Dosimetric Comparison Analysis of Two Different Algorithms in Lung Stereotactic Body Radiotherapy in Terms of Target Coverage and Organs at Risk Doses

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INTRODUCTION & OBJECTIVE

Stereotactic Body Radiation Therapy (SBRT) for lung cancer requires highly accurate dose calculation algorithms due to extreme tissue heterogeneities. The Anisotropic Analytical Algorithm (AAA) utilizes radiological scaling, whereas the Acuros XB (AXB) algorithm solves the Linear Boltzmann Transport Equation. This study evaluates and compares dosimetric differences between AAA and AXB in lung SBRT treatment planning.

MATERIALS AND METHODS

Twenty NSCLC patients treated with SBRT were retrospectively analyzed. Plans were generated using AXB and AAA with identical beam geometry and parameters with dose prescription of 54Gy in 3 fractions. Target dosimetric indices evaluated included PTV V100%, V90%, Dmin, Dmax, Dmean and Paddick conformity index (CI).

RESULTS SUMMARY

Parameter / Structure	Acuros XB (AXB)	AAA	Comparison / Significance
PTV V100%	93.44%	95.54%	Diff: 1.9% (P < 0.05)
PTV Dmin	5150 cGy	5293 cGy	P < 0.05
PTV Dmean	Lower	Significantly Higher	P < 0.05
Conformity Index (CI)	0.94	0.97	Comparable (P > 0.05)
Normal Lungs Dmean	430 cGy	434 cGy	AXB < AAA
Normal Lungs V20 Gy	4.73%	4.77%	AXB < AAA
Spinal Cord Dmax	968 cGy	1023 cGy	AXB < AAA
Heart D0.1cc	1324 cGy	1344 cGy	AXB < AAA
Esophagus D0.1cc	807 cGy	844 cGy	AXB < AAA

CONCLUSION

OAR Sparing: AXB systematically calculated slightly lower doses to Organs at Risk (Normal Lungs, Spinal Cord, Heart, Esophagus) compared to AAA.

Overestimation of Target Coverage: AXB predicted lower PTV coverage & doses: AXB showed Lower target coverage V100%, Dmin, and mean doses, showing that AAA overestimates coverage in heterogeneous tissue.