

## The Effect of Low and Medium Resolution Selection on Treatment Planning

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## Abstract

**Objectives:** A low and high resolution is used as calculation resolution for CyberKnife treatment planning. The low resolution calculation conducted 64x64x64 size dose calculation volume, whilst the high resolution calculation is at the native CT resolution mostly 512x512x512. Calculation in high resolution takes more time than low resolution. In clinical practice, to save time, planning starts with low resolution and at the end of the planning, the software plan calculates with high resolution. A new resolution, medium resolution, has been used recently. The medium resolution calculation uses 128x128x128 size dose calculation volume. The present study compared the treatment planning performed in low and medium resolution as a starting resolution.

**Methods:** 22 pituitary adenoma patients treated between July 2013 and December, 2015 in Medicana International Ankara Hospital, CyberKnife Radiosurgery Center were compared through treatment planning in low and medium resolution. All treatment plans were finalized with high resolution after low and medium resolution. Treatment planning was planned on 70% prescribed isodose by using the same collimator. Tumor coverage, maximum dose for critical organs, minimum target dose, mean target dose, conformity index (CI), new conformity index (nCI), gradient index (GI), V10, V12, V14, total MU and treatment time were evaluated in the two different treatment planning.

**Results:** Target volume; mean=3.95cc, median=2.05cc was found. For low resolution: target coverage; mean=96.63%, median=97.05% (std=1.91), brain stem max; mean=4.61Gy, median=3.33Gy (std=3.22), optic chiasm max; mean=9.53Gy, median=9.13Gy (std=5.29), optic nerve left; mean=5.56Gy, median=3.57Gy (std=4.52), optic nerve right; mean=5.31Gy, median=3.68Gy (std=3.67), min target dose; mean=14.35Gy, median=14.8Gy (std=2.94), max target dose; mean=19.44Gy, median=20.69Gy (std=3.74), CI; mean=1.37, median=1.35 (std=0.18), nCI; mean=1.42, median=1.39 (std=0.17), GI; mean=4.00, median=3.69 (std=0.85), V10; mean=4.33Gy, median=3.9Gy (std=2.39), V12; mean=2.33Gy, median=1.8Gy (std=1.88), V14; mean=1.39Gy, median=1Gy (std=1.45), total MU; mean=15635, median=14711 (std=6629.35), treatment time; mean=41.52 min., median=37min (std=16.76) were found. For medium resolution: target coverage; mean=98.58%, median=99.1% (std=1.37), brain stem max; mean=4.43Gy, median=3.16Gy (std=3.35), optic chiasm max; mean=8.83Gy, median=8.33Gy

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#### Abstract

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(std=5.12), optic nerve left; mean=5.11Gy, median=3.38Gy (std=4.37), optic nerve right; mean=4.75Gy, median=3.33Gy (std=3.28), min target dose; mean=15.69Gy, median=16.04Gy (std=2.89), max target dose; mean=19.81Gy, median=21.1Gy (std=3.65), CI; mean=1.38, median=1.37 (std=0.15), nCI; mean=1.40, median=1.38 (std=0.16), GI; mean=3.89, median=3.78 (std=0.62), V10; mean=4.19Gy, median=3.6Gy (std=2.24), V12; mean=2.19Gy, median=1.9Gy (std=1.72), V14; mean=1.27Gy, median=0.9Gy (std=1.30), total MU; mean=15583, median=14907 (std=6720.83), treatment time; mean=40.67 min., median=35min. (std=16.06) were found. Optimization in treatment planning with medium resolution lasted longer than those with low resolution in the present study. Target coverage and dose reduction in critical organs were achieved better with medium resolution.

**Conclusions:** This study shows that; we may start planning with medium resolution and finalize with high resolution calculation model. For a better target coverage and dose reduction in critical organs.