

Comparison of low contrast sensitivity among multi-slice CT units using various mAs setting for the potential benefit of non-MRI compatible, stereotactic radiosurgery (SRS) patients

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Abstract

Purpose: To evaluate the low contrast detectability sensitivity among 4-slice, 8-slice and 16-slice CT units using various mAs settings. Findings of the study may elucidate the most optimal imaging parameter for stereotactic radiosurgery (SRS) patients who are not MRI compatible.

Methods and Materials: Low contrast targets in the CATPHAN phantom (model: CTP 504, The Phantom Laboratory) were imaged on a 4-slice LightSpeed Advantage™ GE CT scanner (GE Healthcare, WI) and a 16-slice LightSpeed Advantage™ GE CT scanner (GE Healthcare, WI) in 8-slice and 16-slice mode. The CATPHAN CTP515 low contrast targets of size 15, 9, 8, 7, 6, 5, 4, 3 and 2 mm for each contrast difference of 1%, 0.5% and 0.3% from the water-equivalent background was imaged using a SRS protocol. Two image sets per setting were acquired for mAs parameters of 300, 350 and 440. Images were evaluated in a blind study by three independent reviewers.

Results: Using 300,350 and 440mAs settings on the 4-slice scanner, the average smallest diameters recorded at 1% contrast were 5 ± 1 mm, 5 ± 1 mm and 5 ± 0 mm and at 0.5% were 7 ± 2 mm, 7 ± 1 mm and 6 ± 1 mm. For the 8 - slice scanner, the average smallest diameters recorded at 1% con-

trast were 7 ± 0 mm, 6 ± 0 mm and 5 ± 0 mm, and at 0.5% were 12 ± 3 mm, 9 ± 1 mm and 6 ± 1 mm. For the 16 - slice scanner, the average smallest diameters recorded at 1% contrast were 7 ± 1 mm, 7 ± 1 mm and 6 ± 1 mm, and at 0.5% were 11 ± 3 mm, 8 ± 1 mm and 8 ± 1 mm. A difference was observed between the 4 and 8 - slice scanners at 300mAs ($p < 0.01$) for each contrast level as well as the 4 and 16 slice at 440 ($p < 0.01$) and 350 ($p < 0.01$) mAs. Additionally, a difference was observed between each mAs for the 8 slice at 1% ($p < 0.01$) and 0.5% ($p < 0.01$) contrast.

Conclusion: Results demonstrate consistently improved low contrast detectability as mAs was increased. CT simulation imaging parameters can be optimized to improve low contrast sensitivity for non MRI compatible SRS patients.

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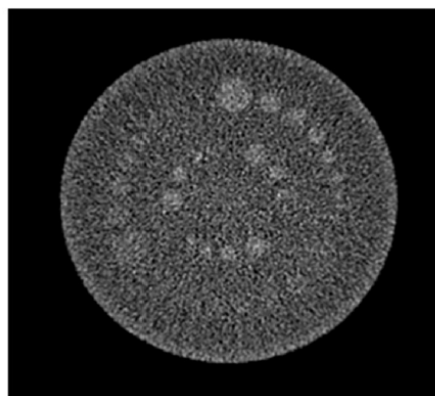


FIG. 1: Sample Evaluation Image

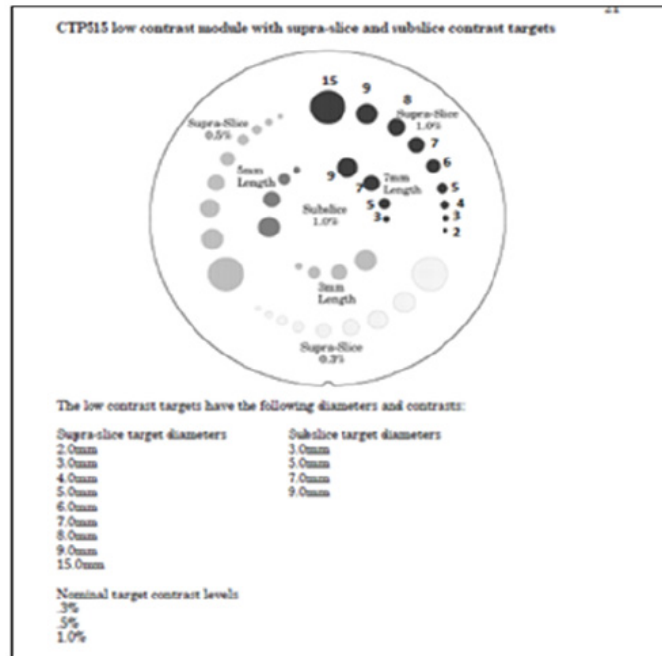


FIG. 2: CATPHAN CTP515 low contrast module

TABLE 1: Average low contrast detectability for various contrast levels

Contrast	4-Slice			8-Slice			16-Slice		
	300 mAs	350 mAs	440 mAs	300 mAs	350 mAs	440 mAs	300 mAs	350 mAs	440 mAs
1%	5±1mm	5±1mm	5±0mm	7±0mm	6±0mm	5±0mm	7±1mm	7±1mm	6±1mm
0.5%	7±2mm	7±1mm	6±1mm	12±3mm	9±1mm	6±1mm	11±3mm	8±1mm	8±1mm
0.3%	8±1mm	8±1mm	6±1mm	NA	12±3mm	8±1mm	15±0mm	14±2mm	14±2mm

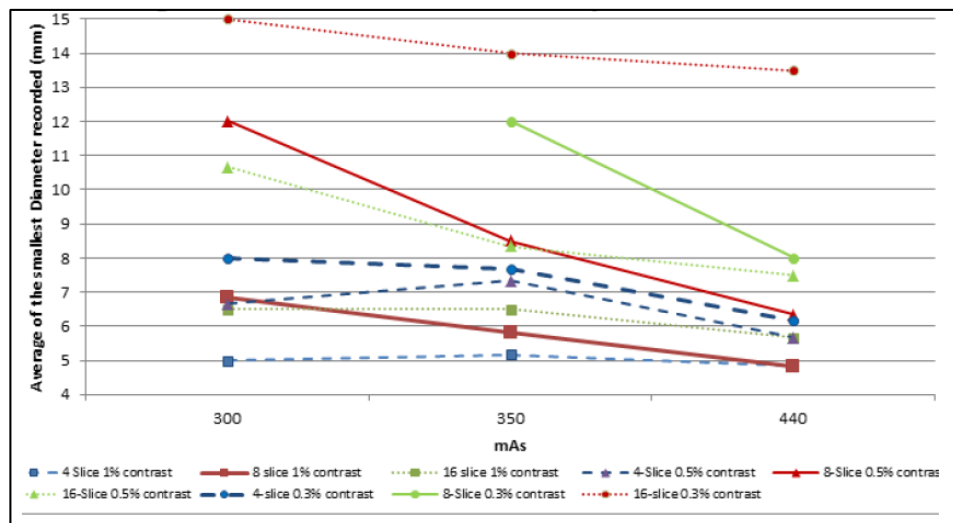


FIG. 3: Low contrast detectability for various mAs