

Effect of Optical Coherence Tomography Scan Pattern and Density on the Detection of Full-Thickness Macular Holes

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Purpose: To evaluate the impact of different scan patterns (radial versus raster) and scan density on the sensitivity of small full-thickness macular hole (FTMH) detection using spectral domain optical coherence tomography (SD-OCT), and to identify morphologic hole characteristics associated with discrepancies in detection of FT defects between different scan patterns/densities.

Methods: Retrospective consecutive case series of 25 eyes undergoing Heidelberg Spectralis SD-OCT imaging with concurrent 24-line radial, 6-line radial, and 61-line raster scan patterns. Included eyes had small (<600um) FTMH on greater than or equal to 1 of the 3 studies. For each scan pattern, the rate of failure to detect a FTMH was recorded. Anatomic hole parameters were recorded and analyzed to identify factors associated with failure to detect FT defects.

Results: Three eyes with SD-OCT confirmed FTMH were not identified on 6-line radial scanning, while five eyes were missed on 61-line raster scanning. All 25 FTMHs were detected by 24-line radial scanning. Comparison of FT detection indices revealed a significantly greater proportion of perihole B-scans depicting a FT defect when the 24-line radial scan pattern was used compared to 61-line raster, but not 6-line radial scanning. Missed FTMHs were predominantly stage 2 (6-line radial = 3/3; 61-line raster = 4/5). The presence of an attached prefoveal opacity ("flap") was more common in missed holes (6-line radial = 3/3; 61-line raster = 4/5) as compared to identified holes (6-line radial = 7/22; 61-line raster = 6/20). In general, hole dimensions were smaller for FTMHs not identified by 6-line radial and 61-line raster scanning as compared to successfully detected holes.

Conclusion: The results of this small study suggest SD-OCT scanning protocols utilizing a radial pattern and/or greater radial scan density may enhance detection of small FTMHs. This is clinically relevant as earlier detection avoids progression to more advanced stages of FTMH and may allow for less invasive intervention. Further prospective studies are needed to confirm optimal scanning parameters.