Volume Averaging of Spectral-Domain Optical Coherence Tomography Impacts Retinal Segmentation in Children Carmelina Trimboli-Heidler, C.D.O.S¹, Kelly Vogt, B.A.², Robert A. Avery, D.O.^{1,3}

Introduction

- Spectral-Domain Optical Coherence Tomography (SI **OCT**) improves resolution of all retinal layers and reduces image artifacts using eye tracking technolog allowing for automated segmentation and quantitativ measurement of discrete retinal layers.¹⁻⁵
- SD-OCT measurements of retinal layer thicknesses been proposed as a potential structural marker of vis in children with optic neuropathy. ⁶⁻¹²
- **Despite advances in SD-OCT, it remains challenging** acquire images of sufficient quality necessary for macular segmentation when imaging children.
- Other investigations have acquired measures of tota retinal thickness from SD-OCT performed in children but multilayer retinal segmentation across an entire macular volume has not been reported.
- We investigated how volume averaging influenced the frequency and magnitude of automated multilayer segmentation errors from macular SD-OCT scans performed in children.

Methods

- Macular SD-OCT images were acquired with the Spect SD-OCT (Heidelberg Engineering) using three differen volume settings (i.e., ART 1, 3, and 9 volumes) in child enrolled in a prospective OCT study.
- Total retinal, retinal nerve fiber layer, ganglion cell laye inner plexiform layer, inner nuclear layer, and outer plexiform layer thicknesses were measured around ar ETDRS grid using beta version automated segmentati software.
- The magnitude of manual segmentation required to correct the automated segmentation was classified as either minor (less than 12 lines adjusted), moderate (> and <25 lines adjusted), severe (>26 and < 48 lines adjusted) or fail (> 48 lines adjusted or could not adjus due to poor image quality).
- The frequency of each edit classification was assesse each volume setting.
- Thickness, paired difference and 95% limits of agreem of each anatomic quadrant were compared across volumes.

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Results

			OCT Volumes	
Autom	ated Segmentation			
Errors	atod obginomation	9	3	1
Minor		72	71	22
Modor	nta	2	יי 2	24 24
		J 0	J 0	۲4 ۲۰
Severe		0	0	17
Fail		0	1	12
Total		75	75	75
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- or 9).
- 9 volume scans.
- unnecessary.
- reviewed for errors.

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phenotype correlation. Am J Ophthalmol 2014;158:628-636 e623 thicknesses in children. Am J Ophthalmol 2013;155:354-360.

ibromatosis Institute, Washington, DC (RAA) and by the Gill



Conclusions

SD-OCT volume scans without averaging (i.e., ART 1 volume) resulted in many more automated segmentation errors than volumes acquired with averaging (i.e., ART of 3)

Fifteen percent of ART 1 volume scans failed automated segmentation completely despite having the appearance of a good acquisition and an acceptable image quality score.

Once ART 1 volume scans were manually corrected, some but not all of the results were similar to the ART 3 and ART

ART 3 volume scans, which are acquired in one-third the time of an ART 9 volume scan, required the same amount of manual adjustment to the segmentation.

Once ART 3 and 9 volume scans were manually corrected, there was no appreciable difference in thickness measures, thereby arguing that greater volume averaging is

In children, a minimum of 3 SD-OCT volumes should be obtained to reduce retinal layer segmentation errors. All **SD-OCT** automated segmentation results should be for



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