

Ultra-widefield fundus imaging using CLARUS improves ETDRS grading with classic 7-field fundus photographs

Sejal Ghate, MSE¹; Marta Lopes, BSc²; Ana Rita Santos, PhD^{2,3}; Diana Ramos, BSc²; Torcato Santos, BSc²; Debora Reste-Ferreira, MSc²; Jose G. Cunha-Vaz, MD, PhD^{2,4}

¹Carl Zeiss Meditec, Inc., Dublin, CA, USA; ²AIBILI - Association for Innovation and Biomedical Research on Light and Image, Coimbra, Portugal;

³Department of Orthoptics, School of Health, Polytechnic of Porto, Portugal; ⁴Faculty of Medicine, University of Coimbra, Coimbra, Portugal



Poster #2669 - B0491

PURPOSE

- To analyze and compare grading of diabetic retinopathy (DR) severity level using standard 30° Early Treatment Diabetic Retinopathy Study (ETDRS) 7-field photography and CLARUS 500 ultra-widefield (UWF) imaging system.

METHODS

- A cross-sectional analysis of retinal images from 63 patients having type 2 diabetes with varying degrees of DR was performed. A total of 123 eyes from these 63 patients were considered for analysis.
- Inclusion criteria involved eyes from patients between ages 18 to 90, across a range of ETDRS levels of 10-65, and with visual acuity of at least 20/40 or 20/200 for diabetic macular edema (DME) cases.
- Eyes with significant media opacity and previous photocoagulation treatment were excluded from the final dataset.
- All patients underwent 7-field color fundus photography (CFP) at 30° on a standard Topcon TRC-50DX® camera and UWF imaging at 135° on a CLARUS™ 500 (ZEISS, Dublin, CA) by an automatic montage of two 90° images (nasal and temporal).
- 7-field photographs were graded by two graders, according to the ETDRS criteria.
- For CLARUS UWF images, a 7-field grid was applied using prototype CLARUS software, and the same ETDRS grading procedures were performed inside the grid area only.
- Grading of DR severity level was compared between these two methods to evaluate the agreement between both imaging techniques.

ETDRS severity grading from CLARUS showed agreement with 7-field photography and improved ability to detect IRMA

		CLARUS CFP							n
		10-15	20	35	43	47	53	61	
7-Field CFP	10-15	0	4	3	0	0	0	0	7
	20	0	2	5	0	0	0	0	7
	35	0	1	38	14	5	0	0	58
	43	0	0	6	16	8	1	0	31
	47	0	0	1	2	7	4	0	14
	53	0	0	0	0	0	5	0	5
	61	0	0	0	0	0	0	1	1
n		0	7	53	32	20	10	1	123

Eyes with lower severity level in CLARUS 500: 10 (8%)Eyes with higher severity level in CLARUS 500: 44 (36%)Eyes with same severity in CLARUS 500 as in 7-field CFP: 69 (56%)

Table 1: (Left) Displays the distribution of subjects showing lower, higher or same ETDRS grading in CLARUS 500 compared to 7-Field CFP, (Right) displays the percentages associated with disagreement of ETDRS grading

ETDRS severity level		N	% of higher/lower severity with CLARUS
7-Field CFP	Claruss CFP		
10-15	→ 20	4	57%
10-15	→ 35	3	43%
20	→ 35	5	71%
35	→ 43	14	24%
35	→ 47	5	9%
43	→ 47	8	26%
43	→ 53	1	3%
47	→ 53	4	29%
35	→ 20	1	2%
43	→ 35	6	19%
47	→ 35	1	7%
47	→ 43	2	14%



Figure 1: (a) Displays a CLARUS 500 UWF image which shows higher severity grading, (b) with a lower severity grading than 7-Field CFP due to possible artifacts caused by blurred zones, opacities, or poor dilation.

RESULTS

- According to the CFP 30° images, 14 eyes were considered DR severity level 10-20, 58 eyes were considered level 35, 31 eyes level 43, 14 eyes level 47, 5 eyes level 53 and 1 eye level 61.
- The same DR severity level was achieved with CLARUS 500 UWF images in 56% of the cases.
- However, 44 eyes (36%) showed a worse DR level with UWF images, mostly due to a better visualization of hemorrhages and a higher detection of intraretinal microvascular abnormalities (IRMA).
- Only 8% (n=10) of the cases showed a decrease in severity level with CLARUS 500 system, mainly due to the presence of artifacts in the montage junctions of the 2 images (blurred zones) and presence of cortical cataracts.

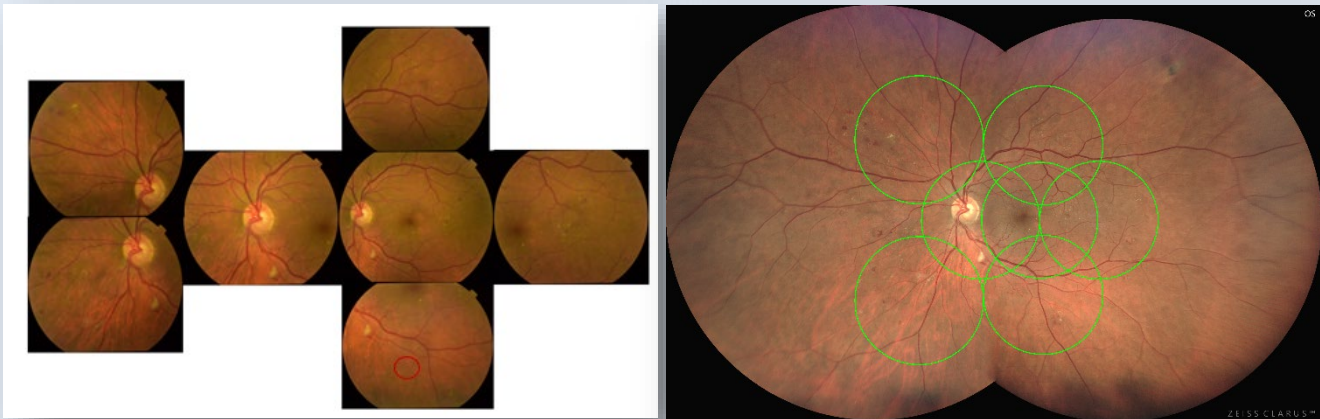


Figure 2: Comparison of 7-field CFP vs. CLARUS UWF CFP

CONCLUSIONS

- The UWF CLARUS 500 system showed a considerable agreement with standard 30° 7-field CFP in all ETDRS levels in images with unambiguous structures.
- CLARUS images showed an improved ability to detect IRMA and to evaluate hemorrhage severity demonstrating that one UWF montage image comprising of 2 widefield CLARUS images can be used to grade DR severity more accurately owing to efficient workflow with overall superior image quality and visualization.

Email: sejal.ghate@zeiss.com

Disclosures: SG (E), JGCV (C) – Carl Zeiss Meditec, Inc.; ML, ARS, SR, TS, DRF - None

