

Weighted Feature Matching registration for tracking choroidal tumors using flicker image presentation



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PURPOSE

Fundus imaging is essential in documenting choroidal tumors, and the comparison of images between visits is critical to assess the progression of choroidal tumors and their therapeutic complications. When comparing images, it is important that the region of interest is aligned and displayed to accurately evaluate change. This display is generated through image registration algorithms.

The purpose of this study is to investigate the use of Weighted Feature Matching (WFM) registration with flicker image presentation of serial fundus images to detect changes in choroidal tumors.

METHODS

- In this retrospective study, 22 eyes from 21 subjects with progression of choroidal tumors or therapeutic complications such as radiation retinopathy were imaged over consecutive visits (154 ± 105.7 [mean,std] days between visits) using CLARUS™ 500 (ZEISS, Dublin, CA) with true color widefield imaging.
- WFM registration is a new registration algorithm to improve peripheral retinal registration with minimum reduction to registration performance in the center of the image. This method was used to register images from consecutive follow-up visits. An animated flicker image with 500ms delay was created for each of the registered pairs.
- An expert clinical grader evaluated side-by-side unregistered images, WFM registered images, and WFM flickered fundus images from consecutive patient visits for change in intraocular tumors. Changes were graded as: 0 no change, 1 possible change, and 2 change (progression or regression). No registration artifacts were appreciated during the assessment.

CONCLUSIONS

In this project, we created registered flicker images that performed better in detecting subtle changes in choroidal tumors than the registered and unregistered side-by-side images. Future studies will include multiple graders and a larger data set with different pathologies.

Reference:1 Su et al. IOVS 2020; 61(7):3640

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RESULTS

- The results of the analyses are shown in Figure 1.
- The changes in tumor or therapeutic complications were easier to track in flicker images than the unregistered and registered images in the consecutive visits.
- Registered images displayed side-by-side were better in tracking changes than the unregistered images displayed side-by-side.
- The use of WFM method in registration produced comparable clinical performance to previously published literature¹.
- Figure 2. shows some of the examples of the graded images.

	No change: 0	Possible change: 1	Change: 2
Unregistered side-by-side images	32.5%	10%	57.5%
Registered side-by-side images	26.2%	8.8%	65%
Flicker animation	10%	15%	75%

Figure 1. Analyses of No change (0), Possible change (1) and change (2) grades between consecutive visits

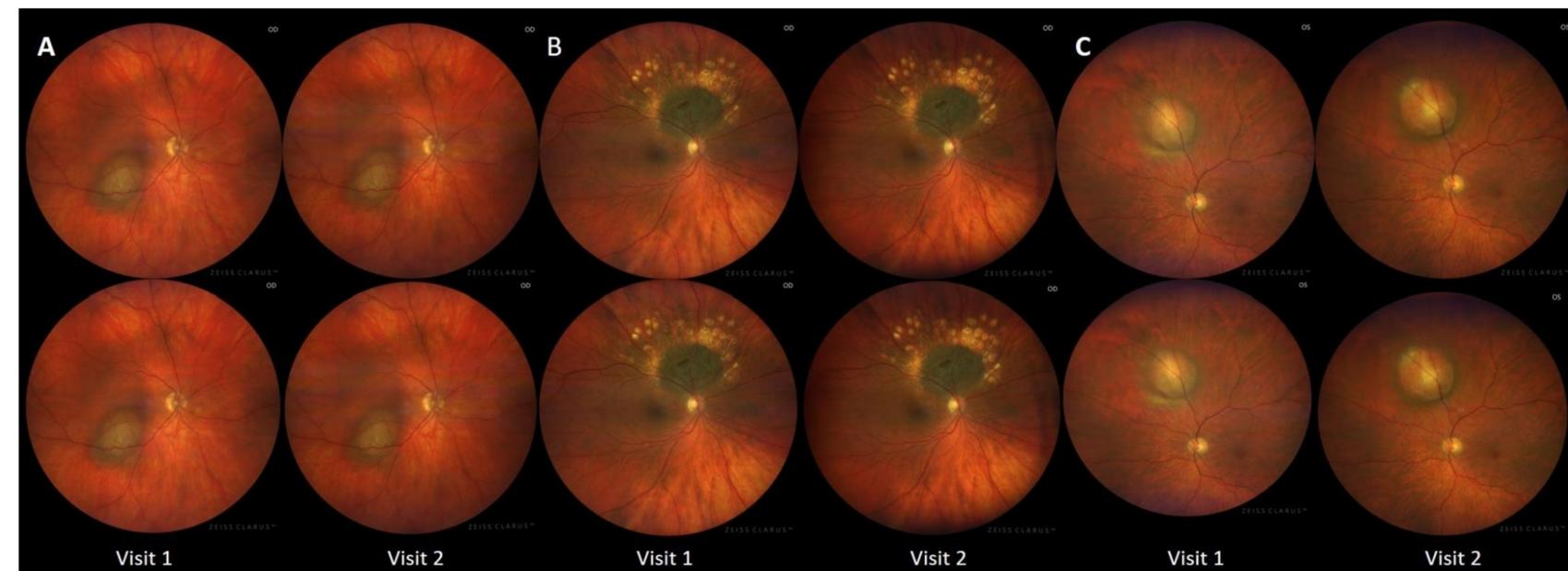


Figure 2. Unregistered images (top row) and WFM registered images (bottom row) displayed over consecutive visits (one visit per column). (A) Both unregistered (top left) and registered (bottom left) were graded as "no change". The corresponding flicker presentation was graded as "change" due to observed elevation of the lesion. (B) Unregistered images were graded as "no change", WFM registered and flicker were graded as "change" due to subtle advancement of superior lesion border. (C) All image presentations were graded as "change" due to observable change in tumor diameter.