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PROGNOSTIC IMPACT AND CORRELATION WITH DISEASE ACTIVITY OF 3D OCT BIOMARKERS IN VOGT-KOYANAGI-HARADA PATIENTS

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INTRODUCTION

Vogt-Koyanagi-Harada (VKH) is an autoimmune disease characterized by a chronic bilateral granulomatous panuveitis accompanied by extraocular manifestations, namely of the nervous, auditory, and integumentary systems [1].

Retinal changes documented by **optical coherence tomography (OCT)** were found to have prognostic value, including **detachments between retinal layers with fluid accumulation** [2][3].

The **aim** of this study was to establish an **image processing pipeline** to accurately **segment retinal detachments** that characterize the VKH disease and **estimate the total detachment volume (TDV)**.

METHODOLOGY

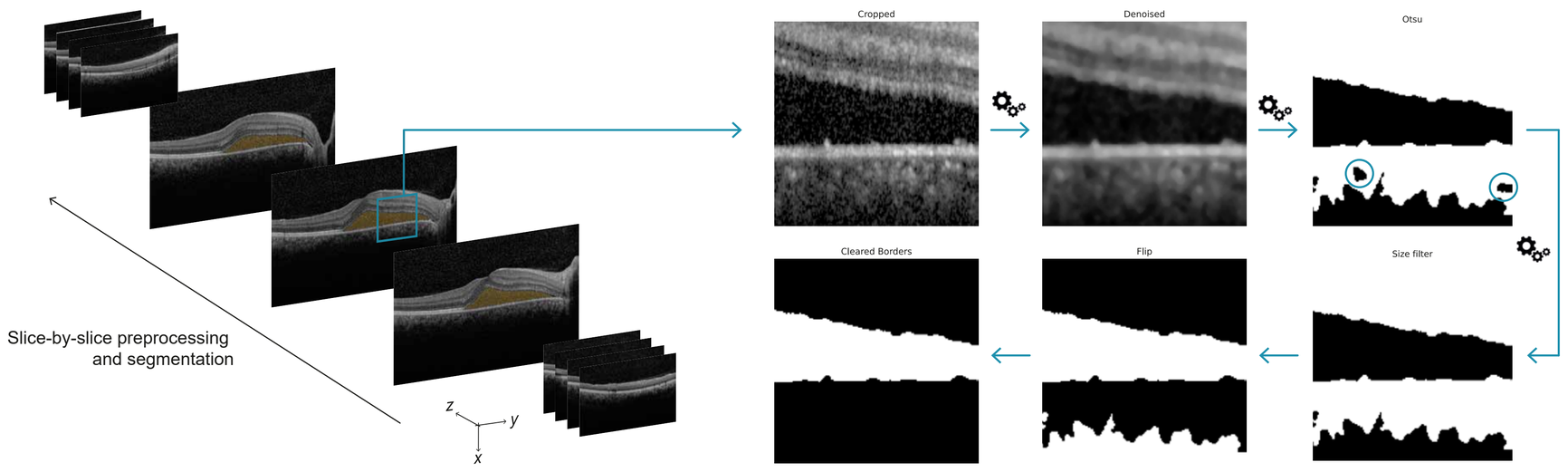


Fig. 1: Image processing pipeline for retinal detachment segmentation. Each slice of the three-dimensional OCT image is subsequently processed using a chain of carefully tuned filters and operations.

Parameter tuning steps:

- Median filter kernel size
- Otsu-based binarization coefficient
- Object / hole size

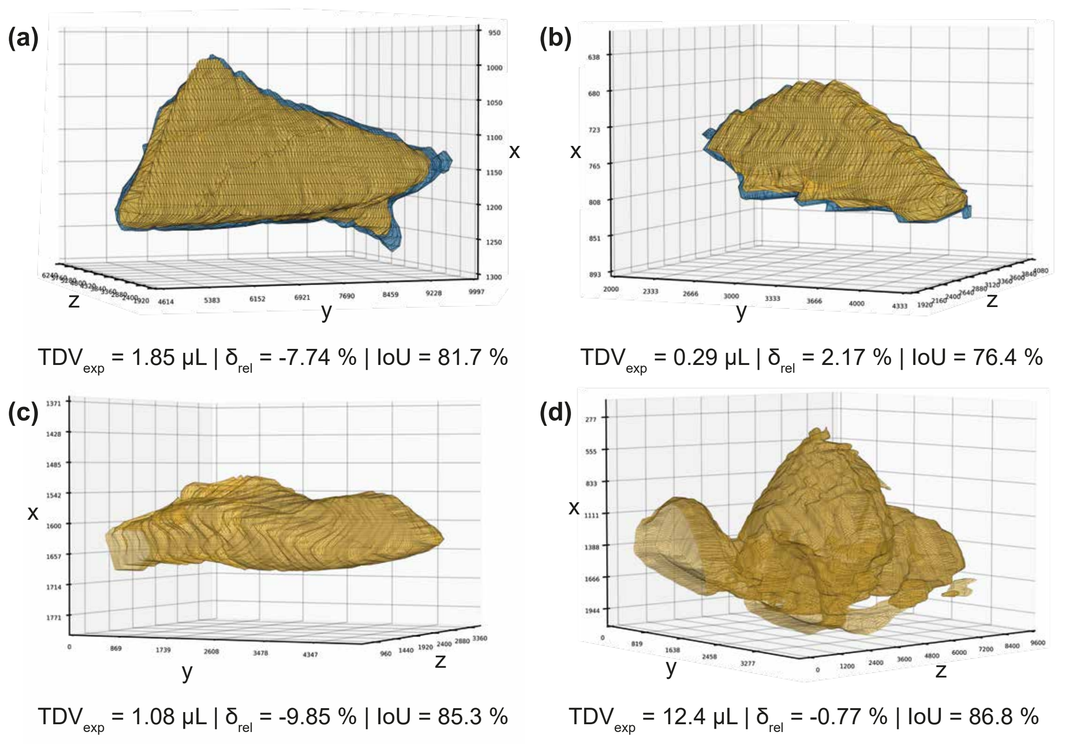
Validation: Experimental masks vs. experts' ground truth masks quantitatively compared using **Intersection over Union (IoU)**.

RESULTS & DISCUSSION

Our pipeline has revealed IoU scores consistently **>75%** over 5 images, demonstrating its ability to efficiently **segment retinal detachments after a parameter tuning process**. Due to this segmentation capacity, the **relative deviations** between the experimental and ground truth TDVs were **below 10%** for all images. The **3D reconstructions** of the detachments identified by our pipeline helped highlighting their **different morphologies**, as illustrated in Fig. 2.

The use of our strategy could open the door to establishing **biomarkers** from OCT scans in VKH patients using the segmented volumes, including **surface irregularities**, **distribution of retinal fluid** within the detachments, **number** of detachments and **retinal layers directly involved**, among others.

VKH has a low incidence in Portugal, resulting in a **residual amount of available data**. OCT artifacts such as scan line shadows or Poisson noise are another limiting factors for the success of this project.



TDV_{exp} = 1.85 µL | δ_{rel} = -7.74 % | IoU = 81.7 %

TDV_{exp} = 0.29 µL | δ_{rel} = 2.17 % | IoU = 76.4 %

TDV_{exp} = 1.08 µL | δ_{rel} = -9.85 % | IoU = 85.3 %

TDV_{exp} = 12.4 µL | δ_{rel} = -0.77 % | IoU = 86.8 %

Fig. 2: 3D reconstruction of four retinal detachments. Plots **(a)** and **(b)** include the ground truth volumes overlayed in blue. Plots **(c)** and **(d)** aim to highlight distinct detachment morphologies. Axes values correspond to the pixel locations (in µm) in the respective image.

CONCLUSIONS & FUTURE WORK

Despite being in **initial stages**, this semi-automated approach offers a **promising tool for clinicians to detect retinal changes in VKH patients**. By enabling early and precise detection of fluid accumulation and retinal detachments, this method can **enhance prognostic evaluations** and potentially improve patient management and treatment outcomes.

In terms of **segmentation**, our group intends to adopt strategies based on **deep learning** models, in line with the trend in biomedical image segmentation. To more accurately study the **prognosis of VKH**, we intend to study **features other than TDV**.

REFERENCES

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