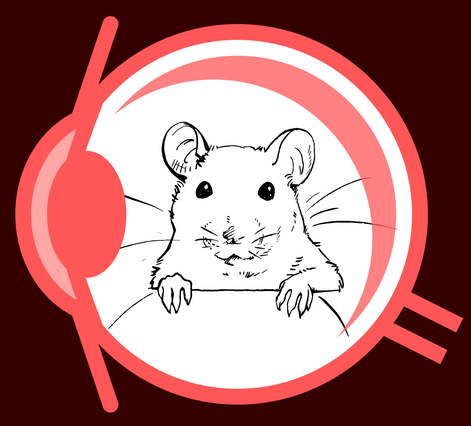
Universitat Autònoma de Barcelona-Facultat de Veterinària

Optic disc size analysis: comparison between diabetic (db/db) and non-diabetic (db/+) mice



Final Degree Project - June 2021

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Wild mice do not suffer from diabetes, but accurate models for this disease are still needed to progress in human medicine. Diabetes mellitus prevalence increases globally, so mortality, morbidity and its costs are a concern for public health.
Diabetic retinopathy is a concerning diabetes complication and it causes papilledema in humans in addition to other lesions.

Objectives

- **Determine if the size of the mouse optic disc is higher in diabetic individuals compared to non-diabetic ones.**
- **Use SLO to assess diabetic retinopathy papilledema in diabetic mice.**

Materials and methods

In this study, db/db mice were used. They are animals with a mutation in the leptin receptor that develop diabetes mellitus type 2 at four weeks of age. Non-diabetic db/+ mice were used as control.
A scanning laser oftalmoscope (SLO) was used to obtain the eye fundus images. The optic discs of 50 individuals were measured with ImageJ® and the data collected was analyzed in Prism®.

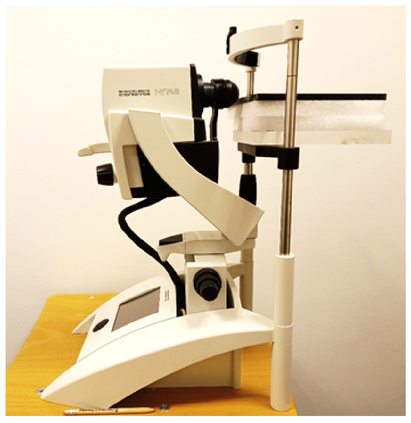

Figure 1: Spectralis Heidelberg Retinal Angiography 2 (HRA2).

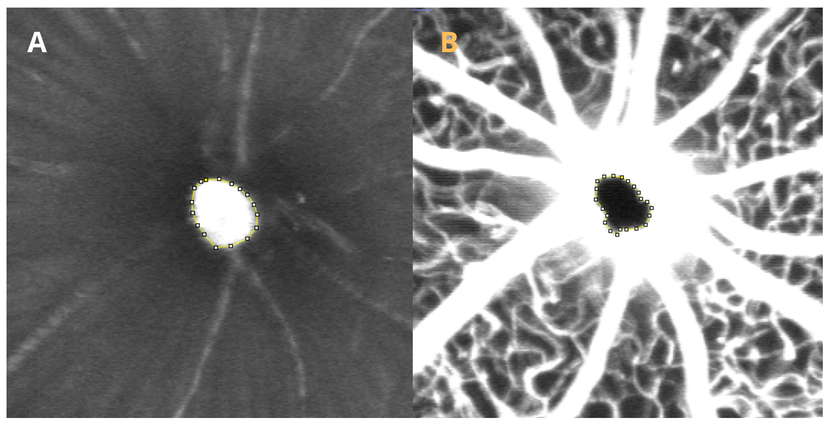

Figure 2: A) Autofluorescence measuring of the optic disc using ImageJ®. **B)** Fluorescein angiography measuring of the optic disc using ImageJ®.

Results

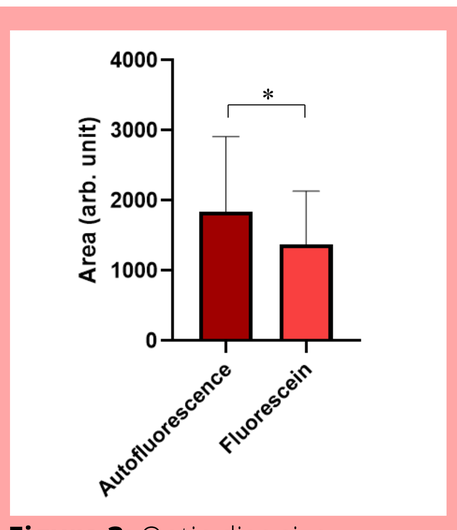

Figure 3: Optic disc size comparison between autofluorescence mode and fluorescein angiography mode in control group (p value= 0,0028).

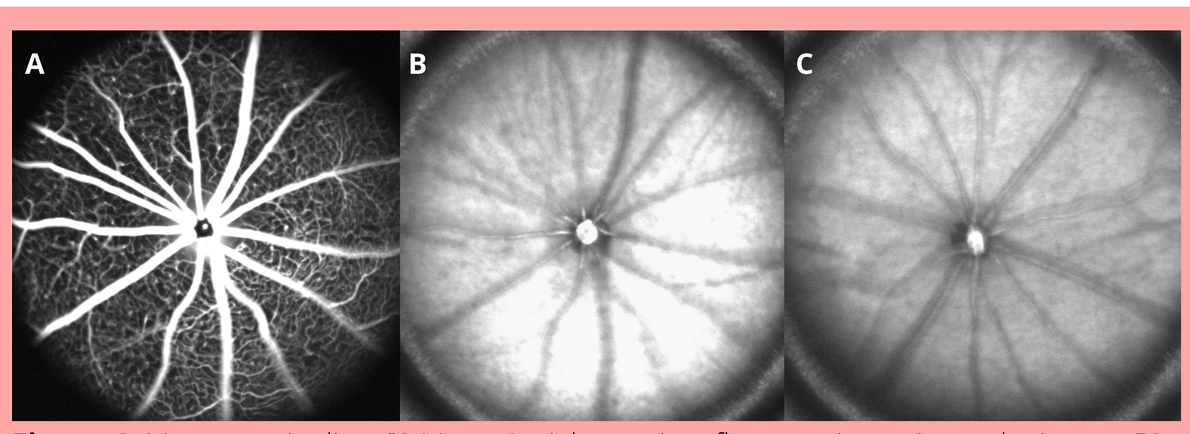

Figure 4: Mouse optic disc. **A)** Mouse's right eye in a fluorescein angiography image. **B)** Mouse's right eye in autofluorescence mode. **C)** Mouse's left eye in autofluorescence mode.

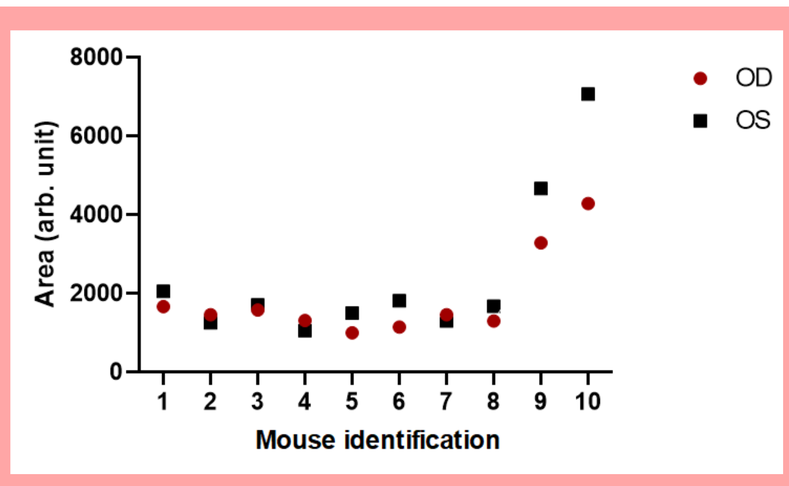

Figure 5: Optic disc size comparison between individuals and between their left (OS) and right (OD) eyes.

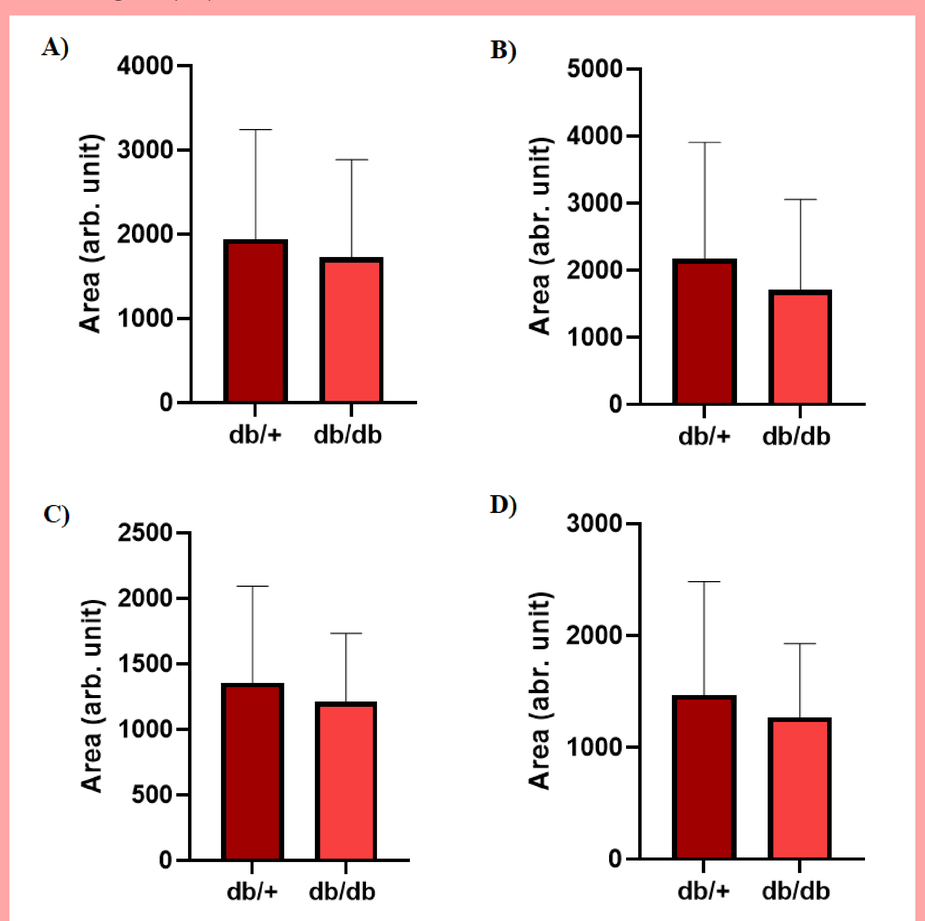

Figure 6: Comparison between diabetic and non-diabetic mice optic disc size. **A)** Right eye in aufluorescence mode (p=0,7100). **B)** Left eye in autofluorescence mode (p=0,5445). **C)** Right eye in fluorescein angiography (p=0,4389). **D)** Left eye in fluorescein angiography (p=0,4224).

Conclusions

1- In both fundus autofluorescence images and fundus fluorescein angiographies it is possible to observe and measure the mouse optic disc (**Fig. 2**).
2- The optic disc size is significantly higher in autofluorescence images than in fluorescein angiographies of the fundus (**Fig. 3**).
3- The size of the mouse optic disc varies between individuals and between the same individual's eyes (**Fig. 5**).
4- There are no significant differences between the optic disc size of diabetic mice and non-diabtetic mice in the autofluorescence mode nor in the fluorescein angiography mode (**Fig. 6**).
5- Nowadays, a perfect mouse model to study human diabetic retinophaty does not exist. In this study, increased optic disc size (oedema) has not been found in diabetic mice.

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