

Quantitative assessment of alpha-synuclein pathology in Parkinson's Disease model mice

Karin Valkevitch, Frederik Lanng, Pekka Kallunki, Florence Sotty



BACKGROUND

Parkinson's Disease (PD) is a neurodegenerative disease affecting primarily the motor system and linked to the spread of the neuronal protein α -synuclein. Animal α -synuclein preformed fibril (PFF) models for PD show protein spread throughout the brain.

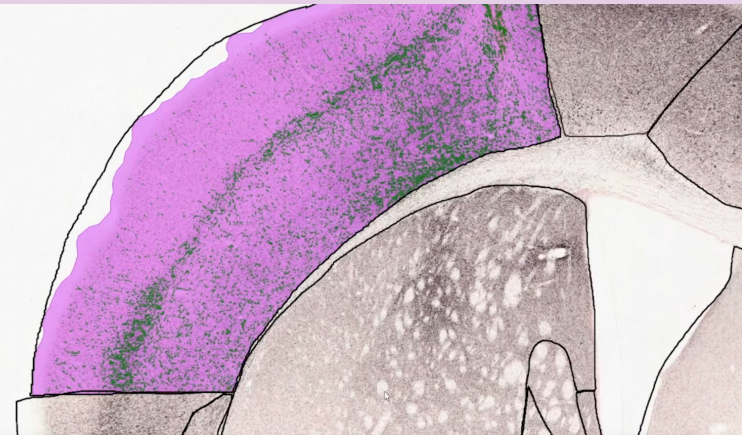
Traditionally neuronal cell counts are done manually, but AI-based image recognition is a useful classification method to save time and reduce error.

STUDY DESIGN

The aim was to improve the efficacy of quantification of pathology in animal models through cloud-based digital image processing and analysis to quantify α -synuclein positive neurons and, thus, the total area of pathology.

Sample Preparations

- 12 wildtype mice
- PFFs injected into dorsal striatum of mice; enter cells and transfer to infect new cells



Artificial Intelligence Image Analysis

- Neural networks trained to identify and quantify α -synuclein pathology
- 35 brain areas in 16 sections (outlined)
- Tissue detector (pink) and α -synuclein detector (green)

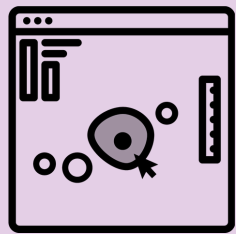
WORKFLOW

1 Perfusion and immunohistochemistry

PFF's generated from recombinant α -synuclein and injected into wildtype mice in dorsal striatum. Samples fixed and stained for phosphorylated α -synuclein and other antibodies.

2 Digital images

Slides scanned as whole slide images (WSI) and uploaded to Aiforia Cloud.



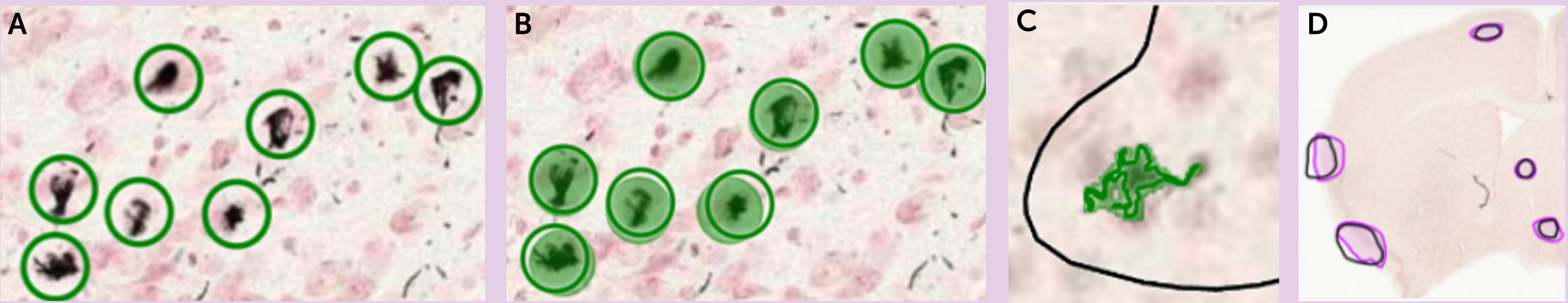
3 Training annotations

Aiforia Create software used to train AI model for regions of interest:

- Detection of cell pathology (a,b)
- Detection of total area of pathology and neuronal tissue (c,d)

4 Aiforia's AI model for automatic pathology quantification

Quantitative assessment of α -synuclein pathology to create a brain map of protein spread in mouse brains.



RESULTS

Aiforia's AI algorithm showed to be a fast and accurate method for detection and quantification of positive α -synuclein staining in cell bodies (Fig 1.) and area (Fig 2.). Manual cell counts were compared to the AI model with a significant correlation (p-value <0.0001) demonstrating the AI-based quantification was as accurate as the manual method in quantifying α -synuclein pathology.

View our [video](#) demonstrating the use of AI in this study

Substantia Nigra

Amygdala

Amygdala

Motor Cortex

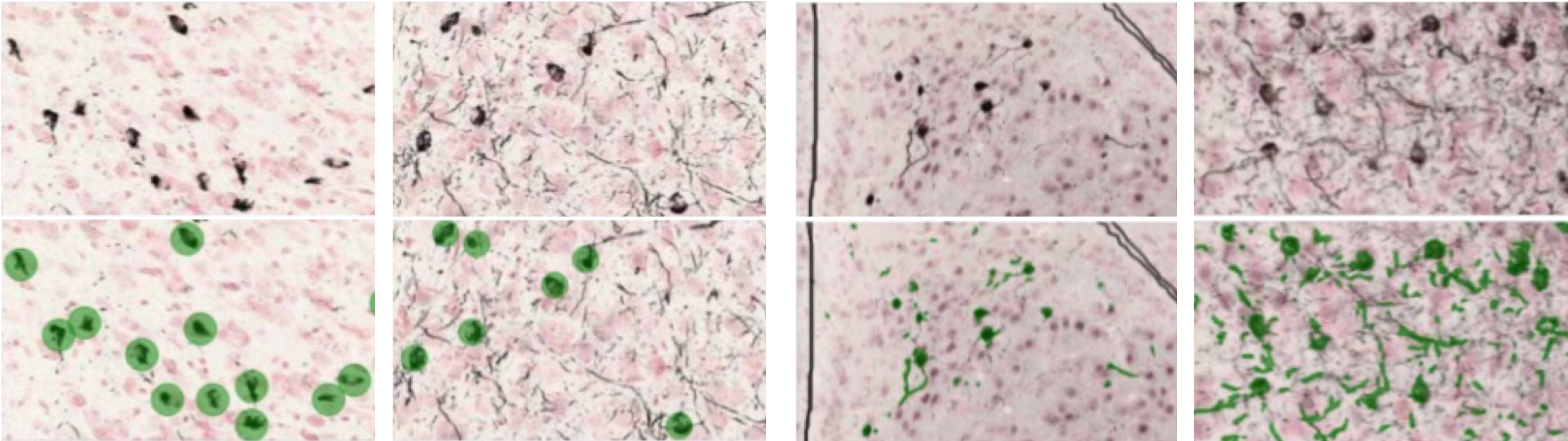


Fig 1. Cell counts in Substantia Nigra and Amygdala before (above) and after AI cell detection (below, green).

Fig 2. Quantitation of area of pathology in amygdala and motor cortex before (above) and after AI (below, green).

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