In-Vivo Visualization of Edinger's Comb and Wilson's Pencils

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Author contributions
Drs. Horn and Herrington wrote the manuscript and performed analyses.
Drs. Alho, Heinsen and Fonoff contributed the dark-field microscopy footage and revised the manuscript.
Drs. Ewert and Polimeni acquired the dataset and revised the manuscript.

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Body text

The “direct” and “indirect” pathways play crucial roles in movement disorder pathophysiology. Both traverse from the striatum to the internal pallidum and substantia nigra, the latter detouring to external pallidum and subthalamic nucleus. Anatomically, the pathways manifest within the striatofugal bundle that passes radially through the pallidum in form of pencil-like tracts (first described by Wilson[1, fig. 1]) before leaving the pallidum toward the substantia nigra in the form of a comb described by Edinger in 1896[2, fig. 2]. A century later, these structures can be visualized in the living human brain (fig. 1 D; fig. 2 A).

Figures

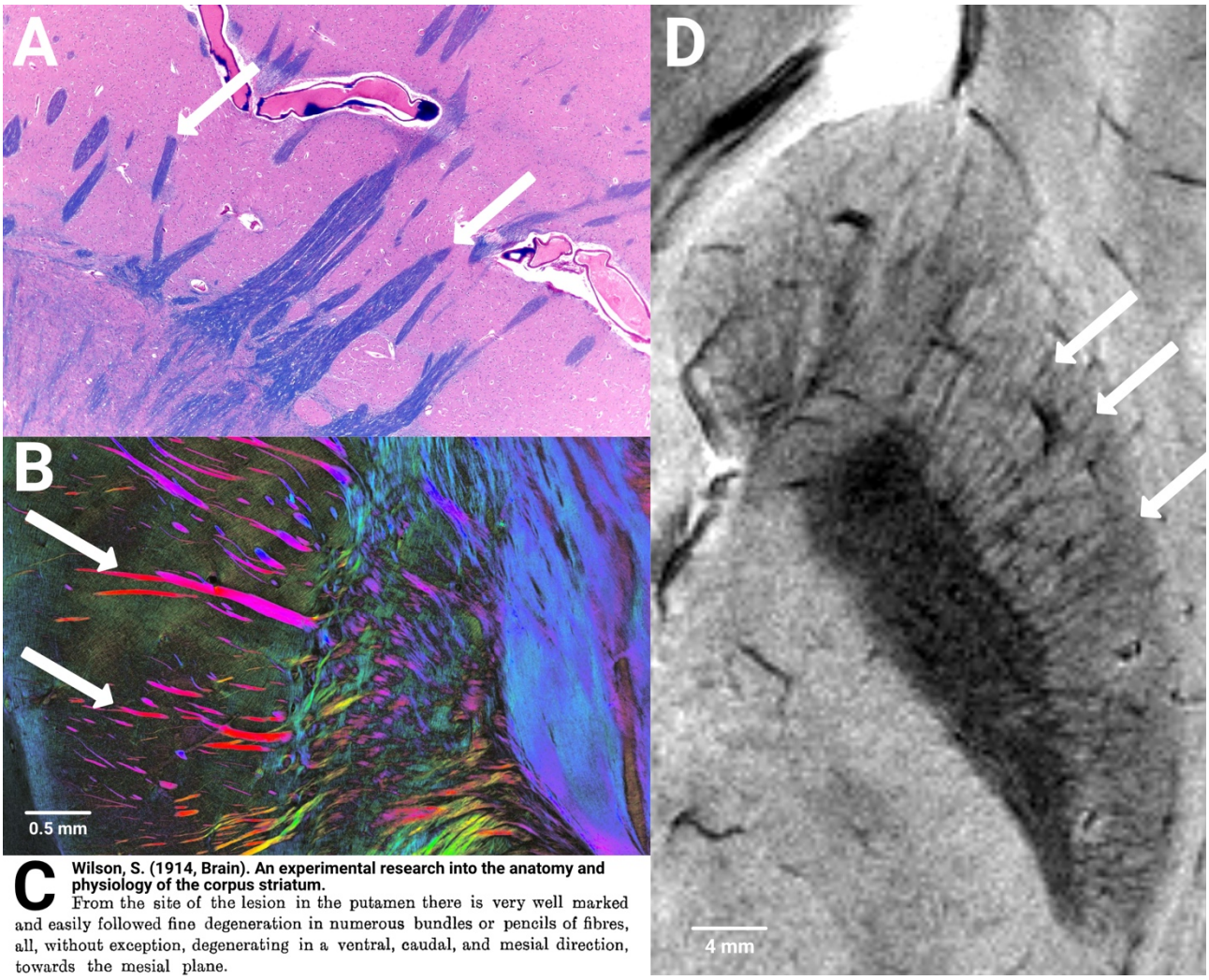

Figure 1: Wilson's pencils. A) Histological depiction (image courtesy Dr. Michael Bonert, McMaster University, CCBY-SA3.0). B) Polarized light imaging in vervet monkey. C) First description by Wilson, Brain. D) Cardiac-gated T2*-weighted FLASH sequence acquired using 7 Tesla MRI showing Wilson's pencils.

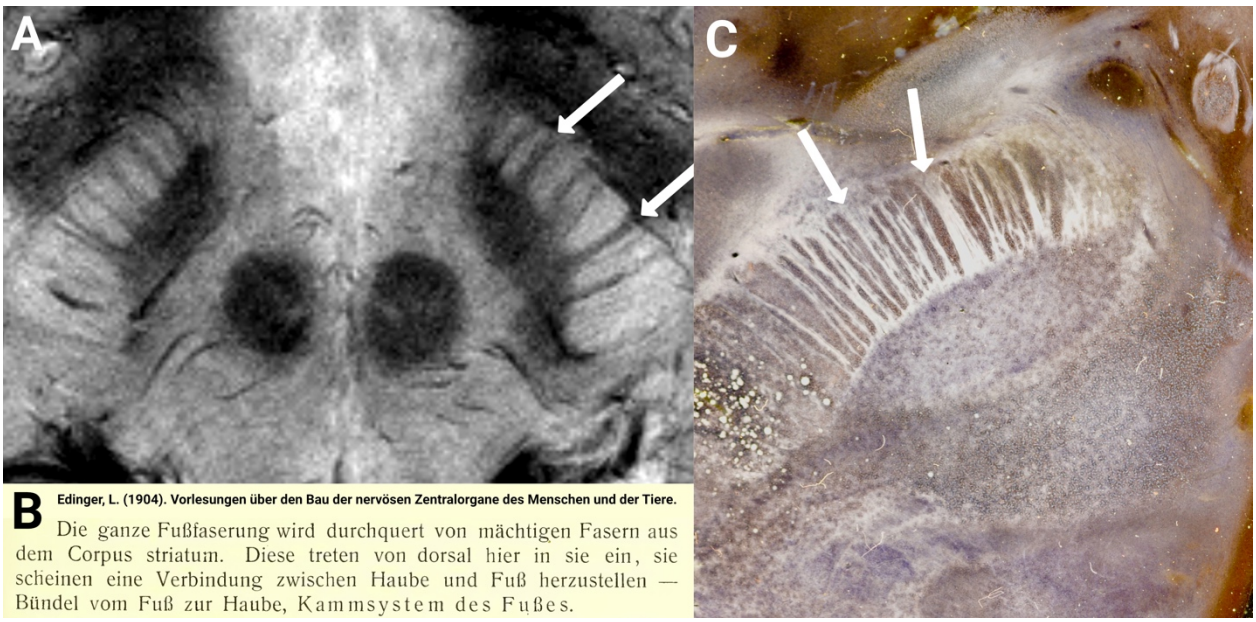

Figure 2: Edinger's comb. A) Cardiac-gated FLASH sequence showing Edinger's comb. B) First description: "The pedunculus cerebri is traversed by striatal fibers that enter dorsally and connect peduncle and tegmentum – Bundle between peduncle and tegmentum, comb system of the peduncle."). C) Axial histological section in dark-field microscopy demonstrating the human comb system.

References

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