How Does Vision Work
How Do We Assess It?
What TBI-vision research is being done?

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How does vision work?

Step 1: Light is focused on the retina
How does vision work?

Step 2: Light converted into a signal

Cross section through the macula

10 layers
How does vision work?

Step 3: The signal is sent to the brain
Why might TBI affect the eye?

Two possibilities:

Coup countercoup mechanism
• Causes diffuse axonal injury (DAI)
• DAI: axonal deformation and swelling caused by the shearing forces of a TBI

Transsynaptic degeneration
• An injury in one part of the brain spreads to other parts
Can we detect TBI damage in the eye?

Nature’s brain slice

The neural retina arises brain tissue and shares the brain’s vascularization patterns

Direct evaluation

Remington LA. Clinical anatomy of the visual system. 2nd ed. St. Louis, Mo.: Elsevier-Butterworth Heinemann; 2005
How do we assess the eye and the retina?

Clinical assessment
How do we assess the eye and the retina?

Clinical assessment
TBI research in my lab

Measurements of retinal thickness

Macula

Retinal Nerve Fiber Layer
TBI research in my lab

Measurements of retinal thickness

Preliminary results suggest that the retina thins in subjects with multiple TBIs.
TBI research in my lab

Measurements of pupillary light reflex
TBI research in my lab

Measurements of pupillary light reflex

The pupillary light reflex significantly more variable in TBI subjects than in controls
Take-home points

• Light enters the eye through the pupil and is captured by the retina

• The retina is a direct forward extension of the brain and is highly assessable

• TBI may damage the retina and alter the pupillary light response

• The eye is a potential platform for the detection of TBI