Neuroanatomical changes in patients with loss of visual function

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Summary

Ocular pathology that causes loss of visual function is associated with neuroanatomical changes of the visual pathways. However, the underlying mechanism of this association is still unclear. Research into the association between ocular pathology and neuroanatomical changes is important, since the remaining capacity of the central visual system to guide the input from the eye towards the visual cortex is believed to be a crucial factor that can affect the success of future vision restoration treatments. Moreover, such research can provide information for a better understanding of the pathophysiology of the investigated eye disease. This, in turn, can give directions to future research on the treatment of the eye disease, which might have to expand its focus from treatment of the eye alone towards treatment of both the eye and brain.

There are several mechanisms that have been postulated to explain the association between ocular pathology and neuroanatomical changes:

- Functional deprivation: the ocular pathology may reduce the activity in the visual pathways which may lead to neuroanatomical changes;
- Anterograde transsynaptic degeneration. This process might cause neuroanatomical changes by "passing on" the pregeniculate degeneration of axons from the eye towards postgeniculate neurons and even to the visual cortex;
- Ocular pathology, such as glaucoma and macular degeneration, could be part of a more generalized neurodegenerative disorder that affects the brain as well as the eye.

In this thesis, I studied neuroanatomical changes in various ocular diseases that cause visual deprivation. Functional deprivation plays an important role in all of the cases. I found no indications that anterograde transsynaptic degeneration plays a role in monocular blindness, suggesting this process plays no important role in causing the neuroanatomical changes in macular degeneration and glaucoma either, Furthermore, POAG should probably be considered part of a more general neurodegenerative disorder. Moreover, such more general neurodegenerative processes may also play a role in AMD.