Author(s)
Principal: Jost Jonas
Presenting: Jost Jonas, M.D.
Contributing: Jost B.J onas
Eduard Berenshtein
Leonard Holbach

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Abstract Information

Abstract Title:
Anatomical relationship between the lamina cribrosa, intraocular space, and cerebrospinal fluid space in non-highly myopic eyes and highly myopic eyes

Purpose:
The lamina cribrosa as the main structural element of the optic nerve head forms a pressure barrier between the intraocular space and the retrobulbar space. The function as a pressure barrier may have importance for the pathogenesis of ocular diseases related to intraocular pressure and / or cerebrospinal fluid (CSF) pressure, such as the glaucomas. The purpose of the present study was to study the anatomical relationship between the lamina cribrosa, the intraocular pressure space, and the retrobulbar cerebrospinal pressure space in highly myopic eyes and non-highly myopic eyes, with or without glaucoma.

Design:
Histologic Study

Participants:
The study included 53 globes enucleated due to malignant choroidal melanoma (n=42) without involvement of the optic nerve (control group), or enucleated due to painful absolute secondary angle-closure glaucoma (n=11) (glaucoma group); and 36 human globes with an axial length longer than 26.5 mm which either showed a marked glaucomatous optic nerve damage (n=29) (highly myopic glaucomatous group), or in which the optic nerve was neither affected by glaucoma nor any other disease (highly myopic normal group; n=7).

Main Outcome Measures:
Histomorpühometric thickness of the lamina cribrosa, distance between IOP space and CSF space

Methods:
Anterior-posterior histologic sections through the pupil and the optic disc were morphometrically evaluated.

Results:

In both highly myopic groups compared with both non-highly myopic groups, and within the highly myopic group, in the highly myopic glaucomatous group compared with the highly myopic normal group, lamina cribrosa was significantly ($p<0.001$) thinner. Correspondingly, the distance between the intraocular space and the cerebrospinal fluid space was significantly ($p<0.05$) shorter in the highly myopic normal group than in the non-highly myopic normal group, and in the highly myopic glaucomatous group compared with the highly myopic normal group. The location of the posterior lamina cribrosa surface in direct contact with the pia mater was located close to the optic disc border.

Conclusion:
Thickness of the lamina cribrosa and the anatomical relationships between the intraocular space and the CSF space differ significantly between normal eyes and glaucoma eyes. In highly myopic eyes, the lamina cribrosa is significantly thinner than in non-highly myopic eyes decreasing the distance between the intraocular space and the cerebrospinal fluid space and steepening the trans lamina pressure gradient at a given intraocular pressure. It may explain an increased glaucoma susceptibility in highly myopic eyes. As in non-highly myopic eyes, thinning of the lamina cribrosa gets more pronounced in highly myopic eyes if glaucoma is additionally present. The findings may be of importance for the pathogenesis of glaucomatous optic neuropathy.