

**PENGARUH PEMBERIAN ALFA-TOKOFEROL ORAL TERHADAP
DENSITAS SEL TRABECULAR MESHWORK
(KAJIAN PADA EKSPRESI MATRIKS METALLOPROTEINASE-9 DAN
DENSITAS SEL TRABECULAR MESHWORK TIKUS WISTAR MODEL
GLAUKOMA)**

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ABSTRAK

Latar belakang

Glaukoma adalah neuropati optik ireversibel dengan peningkatan tekanan intraokular (TIO) akibat gangguan aliran *humor aquos* melalui *trabecular meshwork* (TM) sebagai risiko utama. Pada glaukoma, stres oksidatif memicu peningkatan patologi Matriks Metalloproteinase-9 (MMP-9) via jalur NF- κ B/AP-1, menyebabkan degradasi matriks ekstraseluler dan fibrosis TM. Alfa-tokoferol sebagai antioksidan lipofilik berpotensi menekan inflamasi ini dan melindungi TM.

Tujuan

Me Membuktikan pengaruh alfa-tokoferol oral terhadap ekspresi MMP-9 dan densitas sel TM pada tikus Wistar model glaukoma.

Metode

Penelitian eksperimental (*post-test only randomized controlled group design*) menggunakan kelompok kontrol (n=7) dan perlakuan (n=7) yang diberi alfa-tokoferol oral 20 IU/200g/hari selama 28 hari. Ekspresi MMP-9 dinilai via imunohistokimia, dan densitas sel TM via pewarnaan *hematoxylin-eosin*. Reliabilitas diuji dengan ICC dan Kappa. Analisis statistik meliputi uji Shapiro-Wilk, *Independent T-test*, *Mann-Whitney*, dan *Spearman*.

Hasil

Reliabilitas antar-pembaca sangat baik (ICC=0,958; κ =1,000). Ekspresi MMP-9 kelompok perlakuan bermakna lebih rendah dibanding kontrol (p=0,038). Positivitas MMP-9 pada kontrol mencapai 71,4% (termasuk 42,9% positif kuat), sedangkan kelompok perlakuan hanya 14,3% positif lemah. Densitas sel TM terdapat perbedaan tidak bermakna antar kelompok (p=0,400). Tidak ada korelasi bermakna antara ekspresi MMP-9 dan densitas sel TM (p=0,173).

Kesimpulan

Pemberian Alfa-tokoferol oral bermakna menekan ekspresi MMP-9 *trabecular meshwork* pada tikus model glaukoma. Namun, perbaikan struktural densitas sel TM belum termanifestasi dalam 28 hari.

Kata Kunci: Alfa-tokoferol, MMP-9, *trabecular meshwork*, densitas sel TM, glaukoma, tikus Wistar.

**THE EFFECT OF ORAL ALPHA-TOCOPHEROL ADMINISTRATION ON
TRABECULAR MESHWORK CELL DENSITY
(A STUDY ON MATRIX METALLOPROTEINASE-9 EXPRESSION AND TRABECULAR
MESHWORK CELL DENSITY IN A WISTAR RAT GLAUCOMA MODEL)**

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ABSTRACT

Background

Glaucoma is an irreversible optic neuropathy with elevated intraocular pressure (IOP) from impaired aqueous humor outflow via the trabecular meshwork (TM) as the primary risk factor. In glaucoma, oxidative stress pathologically increases Matrix Metalloproteinase-9 (MMP-9) via the NF- κ B/AP-1 pathway, causing extracellular matrix degradation and TM fibrosis. Alpha-tocopherol, a lipophilic antioxidant, potentially suppresses this inflammation and protects the TM.

Objective

To evaluate the effect of oral alpha-tocopherol on MMP-9 expression and TM cell density in a Wistar rat glaucoma model.

Methods

An experimental study (post-test only randomized controlled group design) utilized a control (n=7) and a treatment group (n=7) receiving oral alpha-tocopherol (20 IU/200g/day) for 28 days. MMP-9 expression was assessed via immunohistochemistry and TM cell density via hematoxylin-eosin staining. Reliability was tested using ICC and Kappa. Statistical analyses included Shapiro-Wilk, Independent T-test, Mann-Whitney, and Spearman.

Results

Inter-rater reliability was excellent (ICC=0.958; κ =1.000). MMP-9 expression in the treatment group was significantly lower than in controls (p=0.038). Control MMP-9 positivity reached 71.4% (including 42.9% strong positive), whereas the treatment group showed only 14.3% weak positivity. TM cell density did not differ significantly between groups (p=0.400). No significant correlation existed between MMP-9 expression and TM cell density (p=0.173).

Conclusion

Oral alpha-tocopherol significantly suppressed TM MMP-9 expression in the glaucoma rat model. However, structural improvement in TM cell density did not manifest within 28 days.

Keywords

Alpha-tocopherol, MMP-9, trabecular meshwork, TM cell density, glaucoma, Wistar rat.