



Biomarkers of Primary open- angle glaucoma

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Dear Friends
Season's Greetings!!

It is my humble privilege to present the special issue of IJCEO after successful journey of two years. This issue of IJCEO has several interesting articles on vision threatening morbidity, Glaucoma particularly on diagnosis and awareness of primary glaucoma.

Primary open angle glaucoma (POAG) is a chronic, progressive, multifactorial neuro-degenerative disorder characterized by loss of retinal ganglion cells and their axon leading to optic nerve cupping and visual field defect. It is the second most common cause of blindness worldwide. Approximately 45 million people have open angle glaucoma and morbidity is expected to be 59 million by 2020.⁽¹⁾ POAG has no known cause but major ocular risk factors are increased intra ocular pressure and aging. Study of biomarkers is necessary in order to further understand the etiological factors in POAG. Biomarkers are molecules available in body fluids and tissues, are indicators of normal biological or pathogenic processes and to monitor the pharmacological response to therapeutic intervention. Biomarkers could be crucial tools for early diagnosis and prognosis of POAG and important tool to identify the individual at risk. Several non-genetic biological markers have been identified which have an association with POAG but still need validation. All known biomarkers of POAG have been isolated in the aqueous humor (AH), trabecular meshwork (TM), optic nerve and blood of the patient.⁽²⁾

The basic pathology in POAG is increased resistance to aqueous humor outflow. The extracellular component (ECM) in the TM is essential for normal AH outflow. A depletion in hyaluronic acid and an accumulation of chondroitin sulfates and undigestible glycosaminoglycan have been associated with POAG. sCD44 in AH could be a potential biomarker for POAG. sCD44 is a trans-membrane glycoprotein acting as receptor for hyaluronic acid and participates in its uptake and degranulation. POAG is associated with high sCD44 in AH and low level of hyaluronic acid in the TM & Juxta canalicular connective tissues.⁽³⁾ ECM is constantly modified by surrounding matrix metalloproteinase (MMPs), which initiates turnover of ECM, which in turn is essential for maintenance of the aqueous outflow homeostasis. Endogenous activity of MMP3 & MMP9 in TM may be an important marker.⁽⁴⁾ Expression of fibronectin, laminin and thrombospondin-1 has been shown to be increased in the TM of POAG.⁽³⁾ The ECM is also modulated by cytokines. The most widely studied cytokine is TGF β_2 . Proteomics study of TM tissues of POAG patient show increased level of ANGPTL7 which could be involved in pathogenesis of POAG. Elevated level of TGF β_2 in AH of glaucoma can lead to increased ANGPTL7.⁽⁵⁾

Several studies show reduced activity of 3α hydroxysteroid dehydrogenase (3α HSD) in peripheral blood lymphocyte from POAG, indicating that 3α HSD may serve as marker of POAG.⁽⁶⁾ Those at risk: AP4A (diadenosine tetraphosphate is protective (via anti-apoptotic method) agent. Study showed Oxidative stress increases the concentration of AP4A in AH of POAG patients mainly due to oxidative stress. BDNF (Brain-derived neurotrophic factors) is polypeptide growth factor, is vital component for building up and preserving neurons. It is useful biomarker of early detection of POAG. Significantly lower level of BDNF has been found in tears of normotensive glaucoma patient. There are several biomarkers associated with POAG. The exact role of each biomarker and its direct link to POAG remains to be established.

References

1. Quigley HA, Broman AT. The number of people with glaucoma worldwide in 2010 and 2020. Br J Ophthalmol 2011;90(3):262-267.
2. Golubnitschaja O, Flammer J. What are the biomarkers for glaucoma? Surv. Ophthalmol.52 (Suppl.2),2007:S155-S161.
3. Nolan MJ, Giovingo MC, Miller AM et al, Aqueous humor sCD44 concentration and visual field loss in primary open-angle glaucoma. J .Glaucoma 2007;16 (5):419-429.
4. Acott TS, Kelley MJ. Extracellular matrix in the trabecular meshwork. Exp. Eye Res.2008;86(4):543-561.
5. Ochiai Y, Ochiai H, Dufort I, Labric F, Luu-The V. Human types I and 3α hydroxysteroid dehydrogenase: differential liability and tissue distribution. J Clin Endocrinol Metab.2001;86:841-6.
6. Ghaffariyeh A, Honarpisch N, Heidari MH, Puyan S, Abasov F. Brain-derived neurotrophic factor as a biomarker in primary open angle glaucoma. Optom Vis Sci 20011;88:80-5.