



# METHOD OF DETECTION OF PRIMARY OPEN ANGLE GLAUCOMA USING METABOLOMIC TECHNIQUES

## Description

Glaucoma (GL) is a multifactorial neurodegenerative disease that includes a set of optic neuropathies that lead to irreversible blindness and thus loss of quality of life. It is characterised by the progressive loss of retinal ganglion cells, responsible for transducing information from the retina to the brain. This disease affects 15 million people in the world and 1 million people in Spain. The main risk factor for the disease is ocular hypertension (OHT), and the only treatment is hypotensive treatment, although it does not prevent the progression of this neuropathy. Primary Open Angle Glaucoma is the most common form of glaucoma (POAG).

According to the WHO, glaucoma is one of the preventable blindnesses, as early identification of the subject with OHT, and the immediate instauration of hypotensive treatment is the only way to counteract the inevitable evolution towards optic neuropathy and vision loss.

A fundamental concept in understanding the danger posed by OHT to eyes and vision is that GPAA is asymptomatic in its early stages. It is called "the silent thief of vision". This is why ophthalmologists and vision researchers have been trying for many years to find clinically usable biomarkers as alternative diagnostics for GPAA and to develop new therapies.

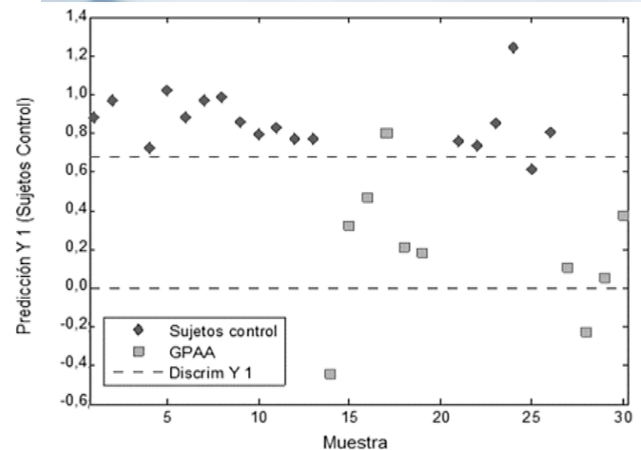
Researchers from the Universitat Politècnica de València, Universitat de València and the Fundación para el Fomento de la Investigación Sanitaria y Biomédica de la Comunitat Valenciana (FISABIO) have developed an in vitro method for the early detection, diagnosis and prognosis of GPAA using a tear sample. The method also allows follow-up in patients already diagnosed. The method developed consists of a metabolomic analysis by high-field NMR spectroscopy of a biological sample.

## Technical advantages

The sample used, the tear, is easily accessible, and is obtained by a non-invasive, painless and inexpensive procedure. It can be stored frozen until the time of metabolomic analysis.

It can be obtained on an ad hoc basis from a wide range of subjects for screening studies to detect the disease, or it can be obtained periodically from a single patient to monitor the disease and observe the evolution with treatment. The sample preparation is simple compared to other techniques, and a protocol has been designed that allows the study to be carried out with a reduced amount of tears, adapted to the real possibilities of sample volume obtained in the real clinical context. En el estudio se han utilizado muestras de pacientes con glaucoma y sujetos control que no padecen glaucoma. No se han tenido en cuenta el resto de circunstancias que acompañan a los pacientes o al grupo control por lo que dados los resultados, se trata de un procedimiento selectivo para discriminar pacientes con riesgo de padecer glaucoma independientemente de si padecen HTO, ojo seco y otras patologías relacionadas.

El análisis metabólico mediante RMN, si bien se realiza utilizando equipamiento sofisticado y de elevado coste, se puede realizar en diferentes instalaciones de universidades y centros de investigación que disponen de este equipamiento y permiten la subcontratación por un coste reducido. La técnica en sí es altamente reproducible y permite comparar resultados obtenidos en diferentes momentos, del mismo conjunto de pacientes o añadir resultados de muestras adicionales para completar un número elevado de muestras o dar un resultado particular sobre la muestra de un determinado paciente.



\* Partial least squares discriminant analysis, PLS-DA. It is observed that there are differences between tear samples from healthy subjects and subjects with GPAA. Furthermore, in the PLS-DA study, the model was calculated with the samples from the training set and applied to the samples from the validation set, obtaining a mostly accurate prediction of the group to which each tear belongs.



## State of Depeloment and Industrial Property Rights

Se ha realizado una prueba con una muestra de 30 sujetos, 11 pacientes diagnosticados de glaucoma primario de ángulo abierto y 19 sujetos control sanos sin patología ocular. Se ha obtenido un modelo estadístico con el 66% de las muestras que posteriormente se ha aplicado al subconjunto de validación, el 33% de las muestras. Se ha obtenido una sensibilidad del 100% y especificidad del 83% para la discriminación de lágrimas de pacientes con glaucoma primario de ángulo abierto frente a las muestras de los sujetos control. Los datos de sensibilidad y especificidad en el conjunto de validación avalan la robustez del modelo y su gran potencial como herramienta de apoyo al diagnóstico del glaucoma.

El producto se ha patentado en la OEPM con número P202131032 y fecha de prioridad 3 de noviembre de 2021 y se ha extendido internacionalmente via PCT.