GLAUCOMA

GIMSO
GRUPO DE INVESTIGACIÓN E INNOVACIÓN
MIGUEL SERVET OFTALMOLOGÍA

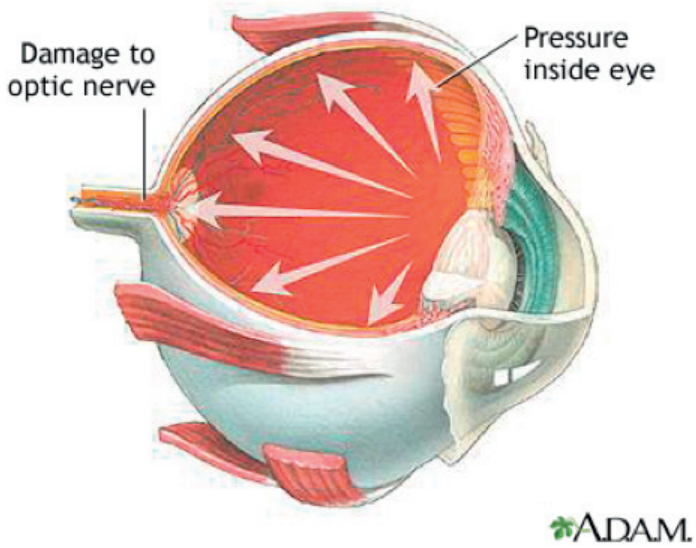
WHAT IS GLAUCOMA?

Glaucoma is an eye disease that damages the optic nerve leading to an irreversible loss of vision.

- Why does this happen?

The main known cause is an increase in pressure inside the eye, a consequence of an imbalance between the formation and drainage of the aqueous humor (the liquid inside the eye). The increase in intraocular pressure damages internal structures of the eye, mainly the optic nerve.

But this is not the only risk factor, because other factors such as age, race, family history of glaucoma and/or genetic factors are also present and furthermore there are eyes with normal pressure which can also suffer from glaucoma .



- How would I know if I have glaucoma?

Glaucoma is an asymptomatic disease, that is, we do not feel pain or any other sensation. Hence the importance of having regular check ups as a method of screening.

As the nerve fibers that make up the optic nerve die, there is a progressive loss of the peripheral visual field, without the patient being aware of it until the disease is very advanced.

Color vision and contrast perception can also be affected (sufferers don't see as well when it is cloudy) and in the advanced stages of the disease, what we know as visual acuity or central vision is affected.

There are some cases in which the rise in intraocular pressure occurs very acutely, usually because the drainage zone is blocked. When this occurs it can cause severe eye pain, dizziness, nausea and vomiting.

- **Can I go blind with glaucoma?**

Thanks to current techniques of early diagnosis and increasingly effective treatments glaucoma is unlikely to lead to total loss of vision.

The outcome will depend on how early the disease is detected, its progression, and on the implementation of the most appropriate treatment in each case. Patient compliance with the therapeutic recommendations given by his ophthalmologist is very important.

- **What should I do if I know I have glaucoma?**

Doctors recommend that in the first ophthalmologic check up we investigate whether glaucoma is present, since it is a disease that affects not only adults but also children and adolescents.

After the age of 40, screening for glaucoma every two or four years is highly recommended, depending on the risk factors that the patient has.

If you want more information:

www.glaucoma.org
https://www.glaucoma-association.com/

HOW IS GLAUCOMA DIAGNOSED?

https://www.youtube.com/watch?v=Nww3CFhWc04

Glaucoma is diagnosed using a series of ophthalmological examinations whose results are assessed by an ophthalmologist, who will confirm or rule out the existence of the disease.

- Measurement of Visual Acuity

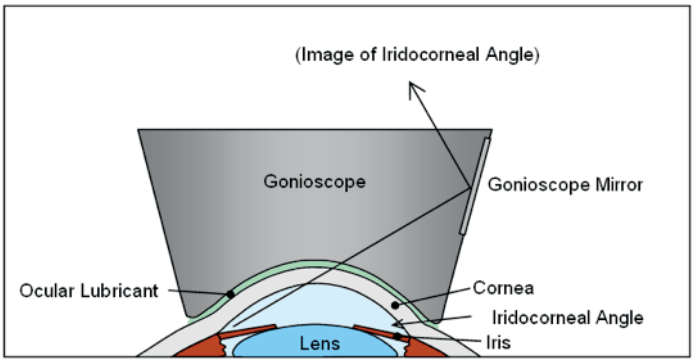
- Measurement of Intraocular Pressure (Air puff Test)

Intraocular pressure is the main risk factor in glaucoma and is currently the parameter that is measured to diagnose glaucoma and evaluate the effectiveness of treatment.

It can be measured with a device called an Air Tonometer, but this method is subject to certain conditions in which errors could arise, for example when patient squeezes their eyes shut or has wounds in the eye.

Therefore, the more reliable and standard measurement is taken with a device called an Applanation (flattening) Tonometer. This instrument consists of a probe (tube) that gently rests on the surface of the eye, anesthetic drops having previously been instilled so the patient does not experience discomfort.

- Evaluation of the Iridocorneal Angle (Gonioscopy)



The iridocorneal angle is a zone of the eye, where the base of the iris attaches to the peripheral cornea and sclera which houses the structure through which the aqueous humor (The liquid in the eye) drains. If it becomes clogged or closes, an increase in pressure occurs and the angle changes.

- Visual field evaluation

Visual field evaluation is a test in which the eye's ability to detect what is around it is analyzed by looking at a fixed point. Glaucoma is a chronic progressive disease. This examination provides information about the patient's vision at the time, and also allows the progression of the disease to be assessed if a series of examinations are performed and compared.

It is a simple and painless test but the patient's absolute cooperation is essential if the interpretation of the results are to be reliable. The test consists of looking at a central fixed point and pressing a button whenever a light of different intensity is perceived as distant or dim as it may seem. The device sketches the field of vision and measures the sensitivity to light at each point in the field.

- Evaluation of the optic nerve

Probably, the analysis of the optic nerve, together with the layer of nerve fibers, is the most important test in the diagnosis of glaucoma since it shows if the optic nerve is damaged and, if so, how it is altered.

Direct assessment of the optic nerve is performed visually. The ophthalmologist looks at the optic nerve directly into the eye through a special magnifying glass using a spotlight.

Technological advances have allowed the development of very precise analytical devices capable of detecting very small alterations in addition to making comparisons between sequential tests.

- Evaluation of the nerve fiber layer of the retina

The retina is the crucial part of the eye. It is full of light detectors and their cables with the job of carrying information to the brain. These cables, or nerve fibers, leave the eye forming the optic nerve.

In glaucoma, these nerve fibers are destroyed by the disease, so if we can assess how many are present we will know if the eye is healthy or damaged.

As they are so slender and are transparent we can not see them when we look at the back of the eye directly, however, we can photograph them using a special filter and observe if there is any alteration in the fibers. In order to be able to make comparisons and to know how the disease is progressing, it is possible to take ocular photographs of the fundus of the eye, retinographies, in 2D as well as in 3D, by means of special photographic systems.

The HRT or Heidelberg Retina Tomograph is a device that makes thousands of photos of the optic nerve in a few seconds and forms a 3D image of the entire optic nerve and surrounding retina.

The OCT or Optical Coherence Tomograph is a device that quickly, simply and harmlessly performs a scan of the layers of the retina, offering images with a resolution in microns; In addition it is able to quantify the thickness of the fiber layer of the optic nerve. It is a useful tool for the diagnosis, monitoring and evaluation of the effectiveness of treatment and for assessing the prognosis.

HOW IS GLAUCOMA TREATED?

There is currently no definitive cure for glaucoma.

The main treatment is to use eye drops (drops) to decrease intraocular pressure. In this way it is sought to protect the optic nerve from damage caused by a high pressure.

There are many types of eyedrops and different administration guidelines, it is very important to carefully follow the guidelines prescribed by the ophthalmologist, since the prognosis of the disease will depend on its progression.

In some cases, where treatment with eye drops are not effective in controlling intraocular pressure, other therapeutic measures are necessary:

- Laser.

A laser is directed towards the drainage zone of the aqueous humor to increase drainage (trabeculoplasty) or towards the iris (iridotomy) to facilitate the exit of fluid; it is also possible to treat glaucoma by decreasing the production of the aqueous humor by cyclophotocoagulation.

- Surgery.

There are many types of surgical interventions, such as valve placement, implants, trabeculectomy, or non-penetrating deep scleroctomy. In all of which it is sought to make an alternative drainage channel for the aqueous humor.

https://www.youtube.com/watch?v=11uYJfeXd3g

WHAT RESEARCH IS GIMSO DOING IN GLAUCOMA?

The research group Miguel Servet Ophthalmology has been active for more than 15 years in the study of eye diseases and in the prevention of blindness.

During the course of this long period different aspects related to glaucoma have been studied :

- **Ability to detect damage to the optic nerve by imaging with new electronic devices.**

  https://www.ncbi.nlm.nih.gov/pubmed/17473725
  https://www.ncbi.nlm.nih.gov/pubmed/25055209
  https://www.ncbi.nlm.nih.gov/pubmed/26567791

- **Relationship between alterations observed in the retina of glaucoma patients and their visual field defects and/or loss of vision.**

  https://www.ncbi.nlm.nih.gov/pubmed/17571000
  https://www.ncbi.nlm.nih.gov/pubmed/28068662

- **Efficacy of surgical treatments in glaucoma.**

  https://www.ncbi.nlm.nih.gov/pubmed/20207977

GIMSO participates in multiple international clinical trials and experimental studies, along with other research centers, comparing the effectiveness of new drugs and new methods of administration.