TEST

Tonometry

Tonometry measures the pressure of the fluid inside your eye.

WHAT IT MEASURES
Fluid pressure inside the eye

SAMPLE
None; measurement taken at the eye

FASTING NEEDED?
No

HOW LONG IT TAKES
Usually a few minutes

RESULTS IN
Immediately; reporting timing varies by clinic, not laboratory

USED FOR
Screening, diagnosis support, and monitoring

MAIN LIMITATION
Corneal thickness and shape can distort the reading

Overview

Tonometry measures pressure inside your eye, called intraocular pressure or IOP. The result is usually recorded in millimetres of mercury, written as mmHg.

Your eye constantly produces and drains a clear fluid. The balance between production and drainage helps determine eye pressure. Tonometry does not measure blood pressure, and high blood pressure does not necessarily mean high eye pressure.

Eye pressure is an important part of checking for glaucoma, a group of conditions that can damage the optic nerve. However, tonometry cannot diagnose or rule out glaucoma by itself. Some people have raised eye pressure without optic nerve damage, while others develop glaucoma with measurements that fall within the usual range.

Several forms of tonometry are available. Goldmann applanation tonometry gently flattens a tiny area of the cornea, the clear front surface of the eye. It is commonly treated as the reference method in eye clinics. Other methods use a puff of air, a small handheld probe, or a brief rebound probe.

Why the test is ordered

Tonometry may be performed during a routine eye examination. It is also used when your eye care professional needs to assess your risk of glaucoma or investigate an eye problem.

Common reasons include:

Ocular hypertension means that eye pressure is higher than expected without detectable glaucoma damage. It does not mean that damage will definitely develop.

- Screening as part of a comprehensive eye examination
- Checking a previous high or unusual pressure reading
- Monitoring glaucoma or ocular hypertension
- Assessing how well pressure-lowering treatment is working
- Checking pressure after certain eye operations, injuries, or inflammation
- Monitoring people using corticosteroids like prednisone or hydrocortisone , which can raise eye pressure

Who should have the test

Tonometry is commonly included in eye examinations for adults, particularly when glaucoma risk is being assessed. How often you need it depends on your age, eye health, family history, previous results, medicines, and the type of eye examination being performed.

You may need more regular testing if you have glaucoma, ocular hypertension, a close family history of glaucoma, or an eye condition that can affect fluid drainage. People using corticosteroid medicines may also need monitoring. These medicines include some eye drops, tablets, injections, inhalers, and skin treatments.

A pressure check may be appropriate after an eye injury or operation. In these situations, the safest type and timing of tonometry are chosen according to the condition of the eye.

How to prepare

You do not need to fast. You can usually eat, drink, and take your usual medicines normally unless the clinic gives you different instructions.

Bring a list of your medicines, including eye drops and corticosteroids. Tell the examiner about recent eye surgery, an eye injury, corneal disease, or previous laser vision correction such as

LASIK.

Contact lenses are normally removed before the test. Avoid squeezing your eyelids or holding your breath during the measurement, because both can briefly increase the reading.

Coffee and exercise can cause small, short-lived pressure changes in some people. For routine appointments, follow your normal habits unless the clinic is comparing readings under controlled conditions.

What happens during the test

The method used depends on the equipment and why your pressure is being checked.

For Goldmann applanation tonometry, numbing drops are placed in your eye, often with a yellow dye called fluorescein. You rest your chin and forehead against a slit-lamp microscope. A small, disinfected prism briefly touches the cornea while the examiner adjusts the instrument. You may see a blue light, but you should not feel the prism touching your eye.

Non-contact tonometry uses a brief puff of air. Nothing touches the eye, and numbing drops are not usually needed. The puff may make you blink or startle, but it is very quick.

Rebound tonometry uses a lightweight disposable probe that touches the cornea for an instant. It is often used when a slit lamp is not practical and may not require numbing drops.

Several readings may be taken from each eye. The measurement itself usually takes only a few minutes, and the result is available straight away.

Understanding your results

Tonometry results are reported in mmHg. Many clinics use roughly 10 to 21 mmHg as a usual adult range, but this is not a firm pass-or-fail boundary. A result outside that range does not by itself establish a diagnosis, and a result inside it does not exclude glaucoma.

Interpretation is based on more than one number. Your eye care professional may consider:

Ranges and interpretation vary by device, clinic, age, sex, pregnancy status, medicines, and clinical context. Tonometry is not generally processed by a laboratory, so device calibration and measurement technique also matter.

Very low pressure may be important after eye injury or surgery, but the meaning depends on symptoms and examination findings.

- Differences between your two eyes

- Changes from your previous readings
- Corneal thickness and shape
- The appearance of your optic nerve
- Visual field and retinal imaging results
- Your medicines, eye history, and glaucoma risk factors

What affects the results

Eye pressure naturally changes through the day. A single measurement may therefore be higher or lower than your usual pressure. Posture, blinking, eyelid squeezing, breath-holding, and anxiety during the test can also alter the result.

The cornea is one of the most important sources of misleading readings. Goldmann tonometry can read higher in a thicker or more rigid cornea and lower in a thinner cornea. Corneal swelling, scarring, an irregular surface, or significant astigmatism can interfere with measurement.

Laser vision correction changes corneal thickness and shape. After procedures such as LASIK or PRK, some methods may underestimate the pressure even when the instrument is working correctly.

Other influences include:

Age and sex may be considered when interpreting results, although corneal features, time of day, medicines, and eye health often have a more direct effect. A recent blood transfusion does not meaningfully alter tonometry because no blood sample is involved.

- Recent exercise, which may temporarily lower pressure
- Caffeine or drinking a large volume of fluid quickly
- Pregnancy, when eye pressure may be lower than usual
- Corticosteroids, which can raise pressure over time
- Glaucoma drops and some other medicines
- Recent eye surgery, injury, or inflammation
- Poor positioning, device calibration, or examiner technique

Accuracy and limitations

Goldmann applanation tonometry is widely used as the clinical reference method, but it is not

perfectly accurate. It relies on assumptions about the cornea that do not fit every eye.

A falsely high result can occur if the cornea is thick or rigid, if you squeeze your eyelids, or if the device or technique introduces error. This may make pressure appear abnormal when it is not.

A falsely reassuring result can occur with a thin cornea, after corneal laser surgery, or when pressure happens to be lower at the appointment than at other times. This can miss pressure peaks. Normal-pressure glaucoma is another reason that a seemingly usual reading cannot rule out optic nerve damage.

Air-puff devices are useful for screening, but an unusual result may need confirmation with applanation or another contact method. Handheld and rebound devices are valuable when standard testing is difficult, although readings from different devices are not always interchangeable.

When the result could change care, repeat measurements are often helpful. Corneal thickness measurement, called pachymetry, can provide context. Optic nerve examination, optical coherence tomography, visual field testing, and assessment of the eye's drainage angle may be better tests for answering other parts of the glaucoma evaluation.

Risks and complications

Tonometry is generally low risk. Air-puff testing does not touch the eye and may cause only brief surprise or discomfort.

Contact methods can cause temporary stinging from the drops or a mild gritty feeling. A small corneal scratch or infection is possible but uncommon when suitable cleaning or disposable probes are used. Do not rub your eye while it is numb.

Tell the clinic if you have previously reacted to numbing drops or fluorescein dye.

What happens next

If the reading fits with your previous results and the rest of your eye examination is reassuring, you may only need routine follow-up at the interval recommended for your eye health and risk factors.

An unexpected reading is often repeated. The examiner may check corneal thickness, use a different tonometer, or arrange measurements at another time of day. Raised pressure may lead to optic nerve imaging, a visual field test, or examination of the eye's drainage angle. Treatment is not based on the pressure number alone.

Seek urgent eye assessment if you have sudden severe eye pain, a red eye, rapidly blurred vision, halos around lights, headache, nausea, or vomiting. These symptoms can occur with a sudden major rise in eye pressure and are different from an isolated high reading found during a routine appointment.

Common questions

Can I drink coffee before tonometry?

Usually, yes. Caffeine may briefly raise eye pressure in some people, so tell the examiner if you have just had a large amount. Follow any specific instructions if your clinic is comparing carefully timed readings.

Does the time of day matter?

Yes. Eye pressure naturally rises and falls over 24 hours. If your readings are inconsistent, measurements at different times may provide more useful information.

Can I exercise beforehand?

Ordinary activity is usually fine. Strenuous exercise may temporarily lower pressure, while breath-holding during heavy lifting may briefly raise it. Mention recent intense exercise if the result is unexpected.

Can I wear contact lenses?

You will usually need to remove them before tonometry, especially for methods that touch the cornea or use fluorescein dye. Bring your lens case and glasses.

Does the air puff diagnose glaucoma?

No. It estimates eye pressure and can help with screening. Glaucoma assessment also considers the optic nerve, visual field, cornea, drainage angle, and changes over time.

Will numbing drops affect my vision?

They may cause brief stinging or mild blur, especially when fluorescein is used. Avoid rubbing your eye until normal sensation returns.

Sources

- National Institute for Health and Care Excellence. Glaucoma: diagnosis and management, guideline NG81
- European Glaucoma Society. Terminology and Guidelines for Glaucoma, 5th Edition

- American Academy of Ophthalmology EyeWiki. Tonometry
- National Library of Medicine, StatPearls. Tonometry
- National Eye Institute. Glaucoma
- Doughty MJ, Zaman ML. Human corneal thickness and its impact on intraocular pressure measures: a review and meta-analysis. Survey of Ophthalmology. 2000;44(5):367-408