

Contact tonometry guide



Tonometry is the measurement of Intra Ocular Pressure (IOP), an essential screening tool in the detection of Glaucoma.

IOP has long been known to be the biggest risk factor for glaucoma development, with a higher IOP holding a significantly increased risk of developing the condition.

Due to variable characteristics of the cornea, there is no perfect method for IOP measurement. However, contact applanation tonometry has long been considered the Gold Standard.

This guide will describe the techniques involved for IOP measurement with Goldmann and Perkins style devices.

Contact VS Non-contact Tonometry

To obtain the 'perfect' tonometry measurement, the surface being applanated must be perfectly spherical, dry, perfectly flexible and infinitely thin. As the cornea fails on all of these criteria, there will be variations in IOP readings between patients with varying corneal thicknesses, rigidities and sphericities. Contact tonometry techniques such as Goldmann and Perkins, aim to minimise the effect of physical corneal variations by using an applanation area of 3.06mm. At this area, the accuracy of IOP readings has been shown to be less effected by corneal thickness (CCT) and rigidity. Contact applanation allows clinicians greater control over the reading, and has shown higher repeatability and accuracy than NCT, with the effects greatest at the extreme ends of the normal IOP and CCT scales.

NB: All tonometers have to assume a set CCT for measurement.

Goldmann and Perkins style contact tonometers assume a CCT of 520 microns.

This is thinner than the average CCT, which is between 540-550 microns.

Contact tonometry technique

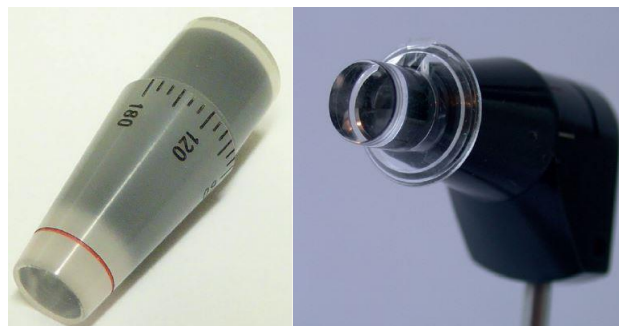
1) Ensure Calibration

Before use, it is important to ensure the tonometer is calibrated to manufacturers guidelines. Typically, calibration involves the use of a prism bar and is conducted at positions 0, 2 and 6 (0mmHg, 20mmHg and 60mmHg).



2) Attach prism

Before measurement can commence, the split prism probe needs to be attached to the contact tonometer head. Due to the contact nature of the technique, the prism probe will need to be removed after each patient.



The clinician can choose to use a reusable probe, to be sterilised after every patient, or a disposable prism probe to be replaced after every patient.

The probe should be inserted so that the white marking lines up with that on the device (reusable prism), or the flat area of probe is superior or inferior (disposable prism). This ensures the mires will be presented horizontally for measurement.

3) Attach contact tonometer

If using a Goldmann style tonometer, the tonometer will now need to be attached to the slit lamp. The method of attachment will vary on the type of tonometer.



R Type tonometers remain attached to Haag-Streit/Tower illumination style slit lamps, rotating in and out of position when needed.

T type tonometers are attached to the slit lamp when needed using a detachable tonometry plate.

U type tonometers remain attached to Zeiss/Lower illumination style slit lamps, rotating in and out of position when needed.



The tonometry plate 'peg' should be inserted into the hole adjacent to the eye being measured ie. the tonometer should be in front of the right eye piece when measuring patient's right eye. This ensures the prism probe approaches the patient's cornea on nasal axis and will remain aligned even in the case of patient convergence, on incoming near object.

4) Describe technique

The technique should be explained well to the patient. IOP has been shown to elevate with tension so the patient should be asked to relax and breathe normally during the technique.

5) Instill anaesthesia and fluorescein

To reduce discomfort and minimise patient blink, topical anaesthetic should be instilled into the patient's eye prior to measurement. Separate or combined minims and strips can be used for this. The amount of fluorescein instilled, can effect the IOP measurement. Excessive fluorescein will create wide measurement mires and potentially an artificially high IOP reading. However, if too little fluorescein is instilled, the mires may be difficult to visualise, making measurement difficult.

6) Conduct initial staining check

Prior to IOP measurement, a fluorescein assessment of the cornea should be performed. Contact tonometry should not be used on patients with excessive corneal staining due to risk of further damage or potential infection.

7) Align prism for applanation

The prism probe and tonometer should now be carefully moved towards the patient's cornea. The clinician should look around the side of the slit lamp during alignment to ensure the probe central prior to applanation. If the probe is misaligned, the mires will appear distorted and the measurement accuracy effected.

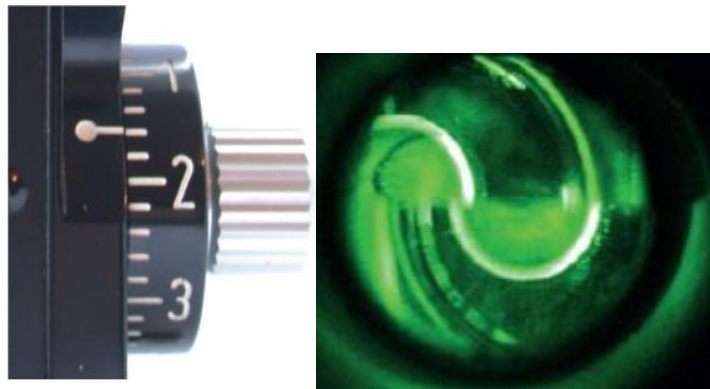
It may be necessary to hold patient's lids to prevent blink during applanation. Caution should be taken to minimise pressure placed on lids as this has been shown to cause artificial increases in IOP readings.

8) Applanate and measure

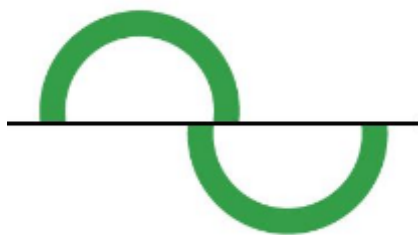
Once in the correct position, the probe should be slowly moved forward until applanating the cornea. Once successful applanation has been achieved, the probe will fluoresce.



The mires should be viewed through the slit lamp eye piece and the tonometer dial adjusted until end point is achieved.

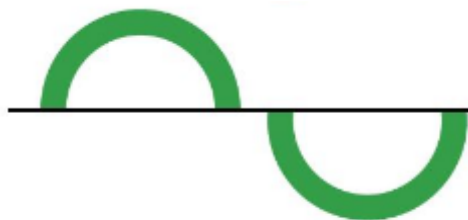


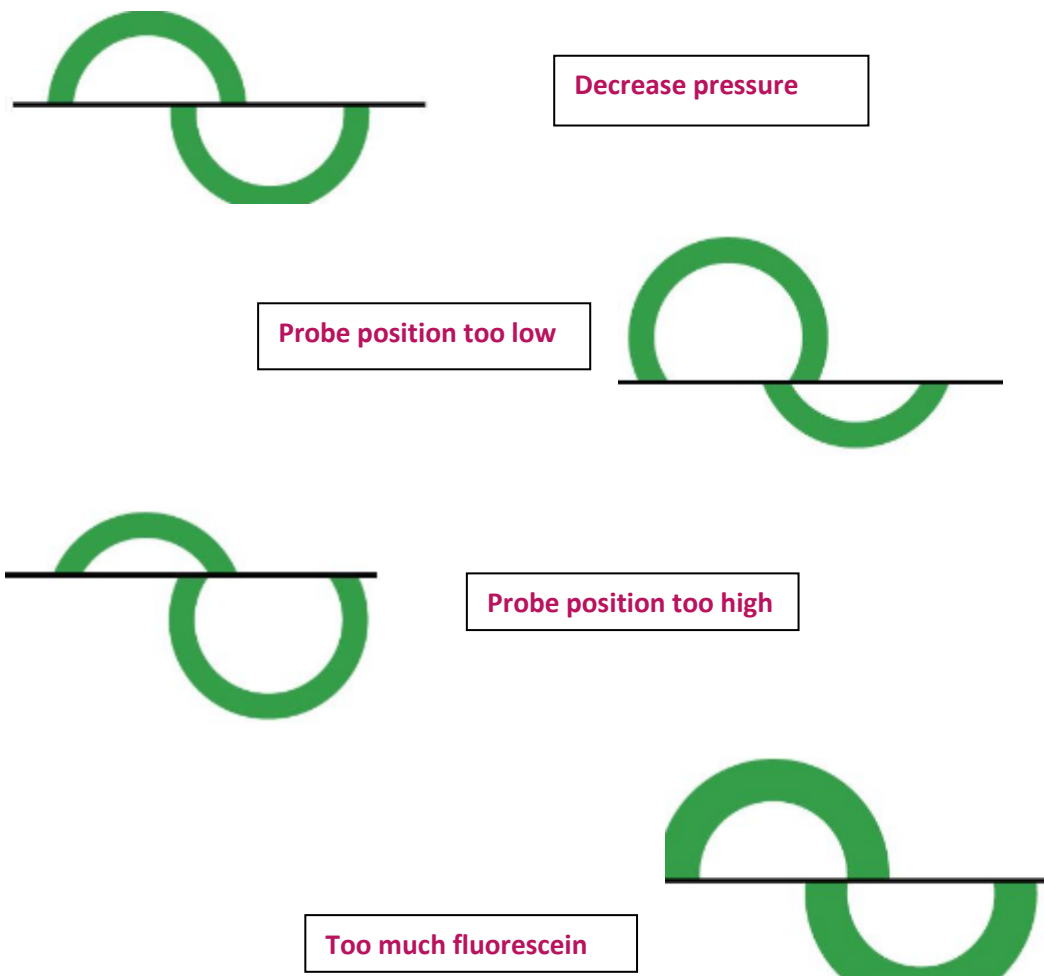
The measurement dial and probe position should be adjusted to reach the correct end point. The appearance of the mires will guide the adjustment needed:



Correct end point

Increase pressure dial





9) Repeat measurement

Just as with NCT, contact tonometry measurements should be repeated. The probe should be removed from the cornea, then re-applanated for repeat measurement. Adjustments in probe position should never occur while applanated for risk of abrasion.

10) Remove and sterilise

At the end of measurement, the tonometer should be moved away from the patient, who can now sit back and relax. The probe should then be removed for sterilisation or discarded, in reusable and disposable probes respectively.

The patient should be advised to avoid rubbing their eyes for at least 30 minutes due to anaesthesia.