BrienHoldenVisionInstitute

CLINICAL TECHNIQUES: ANTERIOR EYE

THINK

A person has glaucoma. What instrument do you need to examine their eyes, and how can you monitor their intraocular pressure?

WHAT YOU WILL LEARN

When you have worked through this unit you should be able to:

- Evert an eyelid
- Perform slit lamp biomicroscopy and use fluorescein to conduct a basic examination of the anterior eye
- Estimate the Van Herrick ratio
- Perform Goldmann tonometry.

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EVERTING THE EYELIDS

WHY DO WE DO IT?

- We evert the eyelids so we can look underneath them, and examine the conjunctiva which lines the inside of the lids
- This is necessary in cases where we need to:
  - Remove a foreign body
  - Check for eye diseases (such as trachoma)
  - Irrigate (wash) the eye and lid.

You should never evert the eyelids in a person who has suffered a penetrating injury of the eye, as it could cause the contents of the eye to come out!

HOW IS IT DONE?

Everting the upper eyelid:

- Ask the person to look down but keep their eyes open
- Assure them it will not hurt
- Gently hold the person's upper eyelid between the thumb and forefinger of your one hand
- With your other hand, gently press the upper eyelid near the crease, using your finger or a cotton bud
- Ask the person to keep looking down
- Quickly but gently evert the upper eyelid
- Hold the eyelid against the eyebrow with your thumb while you examine the conjunctiva which lines the inside of the upper eyelid (the palpebral conjunctiva)
- When you have finished examining the inside of the lid, ask the person to look up and let go of their eyelid
- The upper lid should return to the normal position when the person looks up
- You might need to gently ease the eyelid over if it does not turn over by itself.

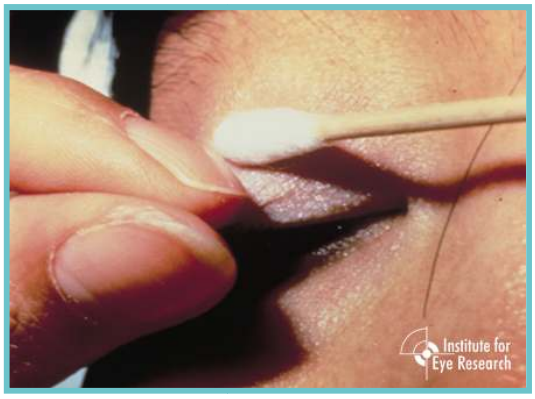

Figure 22-1: Everting the upper eyelid

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Figure 22-2: Examining the upper palpebral conjunctiva

Lower eyelid:

- Ask the person to look straight ahead
- Place your finger on the margin of their lower lid, and pull it down gently
- Carefully examine the conjunctiva lining the inside of the lower lid
- When you have finished, let go of the eyelid.

Figure 22-3: Examining the palpebral conjunctiva lining the inside of the lower eyelid

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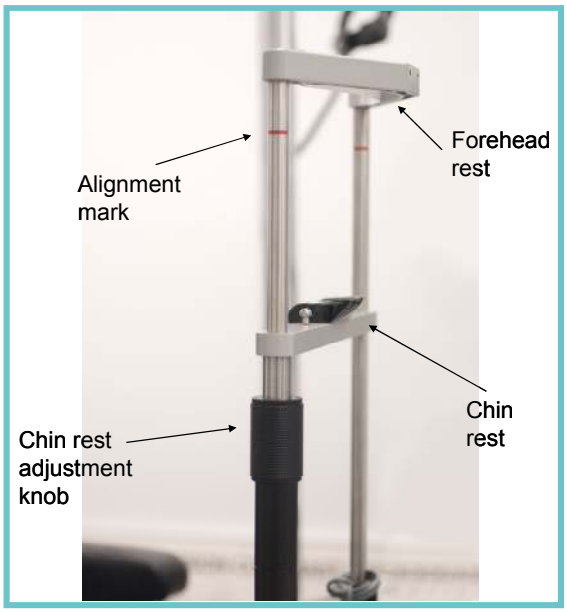
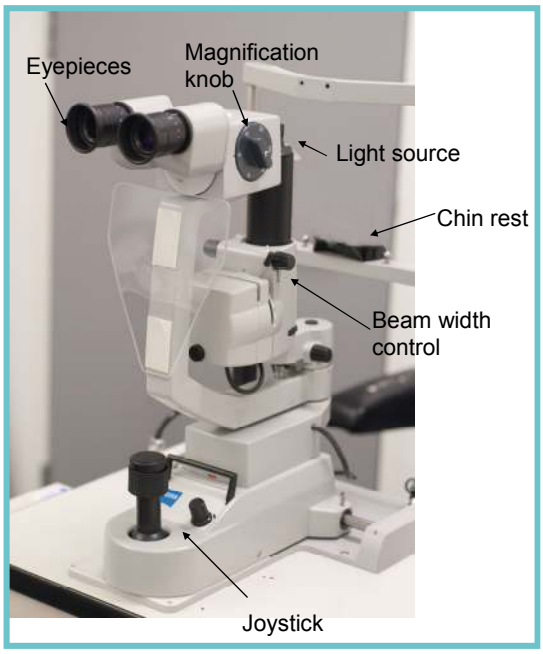
SLIT LAMP BIOMICROSCOPY

WHAT IS IT AND WHY IS IT USED?	• A slit lamp biomicroscope consists of a bright light source and a powerful microscope • Slit lamp biomicroscopy provides a binocular and magnified view of the eye, allowing us to examine the anterior structures of the eye – such as the tear film, cornea, conjunctiva, iris, pupil and lens • Slit lamp examinations are important for identification of a variety of eye conditions and detection of eye problems at an early stage.
PARTS OF THE SLIT LAMP	 ***Figure 22-4a: Parts of the slit lamp biomicroscope***  ***Figure 22-4b: Parts of the slit lamp biomicroscope***

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HOW IS IT DONE?

Preparation:

- Firstly, wipe the chin rest and head rest of the slit lamp with an alcohol swab
- If the person is a spectacle wearer, ask them to take their spectacles off
- Ask the person to put their chin on the chin rest, and their forehead all the way forward and against the head rest
- Adjust the knob under the chin rest to bring the person's head up or down → so that the person's eyes are in line with the black line on the head rest
- Set the magnification to the lowest setting – this is best when you want to get a good overview of the eye
- The joystick moves in three ways:
  - Turning the joystick will move the light up and down
  - Moving the joystick left and right will move the light source left and right
  - Moving the joystick forward and backward will bring the target into focus
- Use one hand to control the joystick, and your other hand to control the magnification and the slit lamp arm
- Ask the person to close their eyes
- Turn the slit lamp on
- Adjust the eyepieces of the slit lamp
  - Focus the light on the person's eyelashes
  - Closing each eye in turn, focus each eyepiece so that the eyelashes come into clear focus
  - Now move the eyepieces closer together or further apart to set it for your PD
  - With both eyes open, you should be able to get a clear single view.

Figure 22-5: Correct alignment of the person at the slit lamp

Examination

- Ask the person to open their eyes
- We always start a slit lamp examination at the front of the eye and gradually move towards the back of the eye
- Start with low magnification and a broad beam of light
- Always examine the person's right eye first

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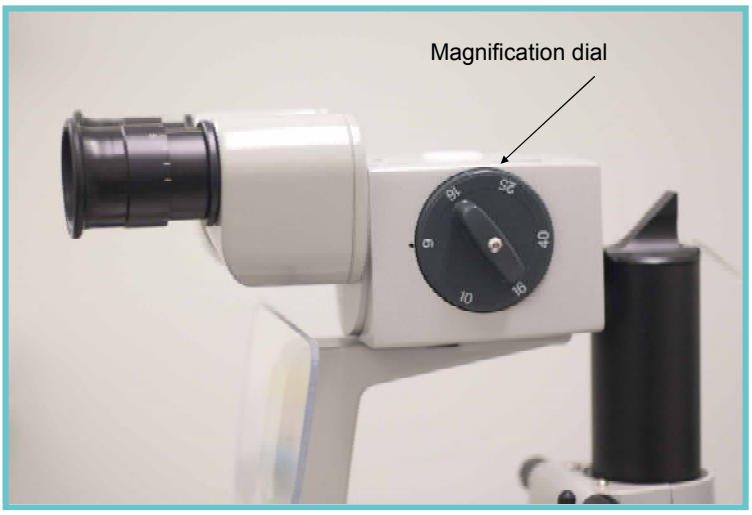

Figure 22-6: The magnification dial

- While looking through the eyepieces, move the slit lamp beam across the lower lid to examine the lid and lashes:
  - The eyelashes should be clean, with no crusts on them and should point away from the eyeball
  - The lids and lid margins should be clean, with no signs of blood, lumps or discharge
- Do the same for the upper eyelid and lashes
- Now look at the conjunctiva:
  - To do this, narrow the slit beam to a medium sized rectangular slit beam (about 4 mm)
- Look at the bulbar conjunctiva:
  - It should be white, with only a few small blood vessels
  - Look for redness, lumps and pigment (spots)
  - Get the person to look up, down, left and right so that you can see more of the conjunctiva
- Evert the upper and lower lids to examine the palpebral conjunctiva:
  - Look for excessive redness and bumpiness
  - There should be no foreign bodies or growths
- Examine the cornea next:
  - Narrow the slit beam down to about 2 mm wide
  - Position the illumination arm of the slit lamp so that it makes an angle of about 30 degrees with the eyepieces, and look at the temporal cornea
  - Move the slit lamp across the cornea from the temporal to the nasal side
  - When you get to the centre of the cornea, move the illumination arm to the other side of the eyepieces (30 degrees to the other side) to keep a clear image
  - The cornea should be clear
  - Look for white spots (scars), blood vessels or anything that disturbs the clarity of the cornea
- Increase the magnification
- Now push the joystick forward so that you can focus on the iris and the pupil
  - Look for dark raised spots on the iris or holes in the iris
- Push the joystick forward just a little more – you will now be focused on the crystalline lens

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- Look for any opacities (these will show up as brown or white patches in the lens).

Whenever you cross from the left side of the eye to the right side of the eye, you need to move the slit lamp illumination arm to the other side of the eyepieces

Remember that the person has a nose – do not hit it with the slit lamp!

HOW DO I RECORD THIS?

- Record what you see and make a note of where on the eye any abnormalities occur

Example:

Right Eye		***Left Eye***
Clear	***Lids***	Clear
Clear	***Lashes***	Crust on the lower lid
Clear	***Conjunctiva***	Pterygium ¼ way to pupil
Small opacity just inferior to pupil	***Cornea***	Clear
Clear	***Media***	Clear
Clear	***Iris***	Clear
Cataract	***Lens***	Clear

Always record everything you see, even if it is normal.

Remember if you don't record it, it is as if you never did it!

REFERRAL CRITERIA

- Refer if you see:
  - Crust or blepharitis on the lashes
  - Lumps on the lids
  - Redness on the bulbar conjunctiva
  - Bumps, growths or excessive redness of the palpebral conjunctiva
  - A pterygium or pinguecula
  - Conjunctival haemorrhage
  - Corneal scars or opacities
  - Foreign bodies
  - Cataracts or opacities of the crystalline lens
- If you are unsure if something you see is normal, you should refer the person.

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USING FLUORESCEIN

WHAT IS IT AND WHY IS IT USED?	• Fluorescein is a dye which is orange in colour; however, when we look at fluorescein with a blue filter (on the slit lamp), it glows (fluoresces) bright green
	• Fluorescein allows us to better examine the cornea, conjunctiva and tear film
	• Fluorescein stains damaged cells on the cornea and conjunctiva
	• When we use fluorescein during a slit lamp examination, it makes it easier to detect a foreign body, such as a metal fragment, or an infected or injured area on the cornea
	• Fluorescein can be very useful in the examination of people with the following conditions:
	  ○ Dry eyes
	  ○ A painful red eye
	  ○ An eye injury
	  ○ A foreign body in their eye
	  ○ A corneal abrasion.

HOW IS IT DONE?	 ***Figure 22-7: Fluorescein strip and sterile saline solution*** Preparation: • Open the fluorescein strip, and be very careful not to touch the orange tip (the part with the dye in it) • Put a drop of sterile saline solution onto the fluorescein strip, without touching the orange tip **Be careful, when using fluorescein** **→ it can stain and ruin people's clothes!**

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Figure 22-8: Wetting the fluorescein strip with sterile saline solution

- Ask the person to look up, and touch the strip onto the lower conjunctiva
- Ask the person to blink, then ask them to sit behind the slit lamp
- Turn the filter dial on the slit lamp until the light is blue.

Figure 22-9: Instilling fluorescein

Examining the tear film:

- Firstly, focus the slit lamp to look at the tear film
- It should appear as a light green film over the cornea
- To check the quality of the tear film, ask the person to blink twice, then ask them to keep their eyes open
- Carefully watch the tear film → after a while you will see the light green film starting to break up and black patches appearing
- The time taken for this to happen is called the tear break up time (TBUT)
- A tear break up time of less than 5 seconds means that the person's tear film is very unstable, and they will probably have dry, scratchy eyes.

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Examining the cornea and conjunctiva:

- Now look at the cornea and conjunctiva
- There should be no staining (green parts)
- Green staining on the cornea or conjunctiva means that there is an abrasion, scratch, infection or injury.

HOW DO I RECORD THIS?

- Record this as you would record other slit lamp examination results
- Make a note on your slit lamp records that you used fluorescein.

Example:

Right Eye		Left Eye
Clear	**Lids**	Clear
Clear	**Lashes**	Crusts on the lower lid
Clear	**Conjunctiva**	Pterygium ¼ way to pupil
Clear with a TBUT< 5sec	**Cornea**	Inferior staining with fluorescein

REFERRAL CRITERIA

- Refer if you see:
  - Staining with fluorescein
  - TBUT less than 5 seconds.

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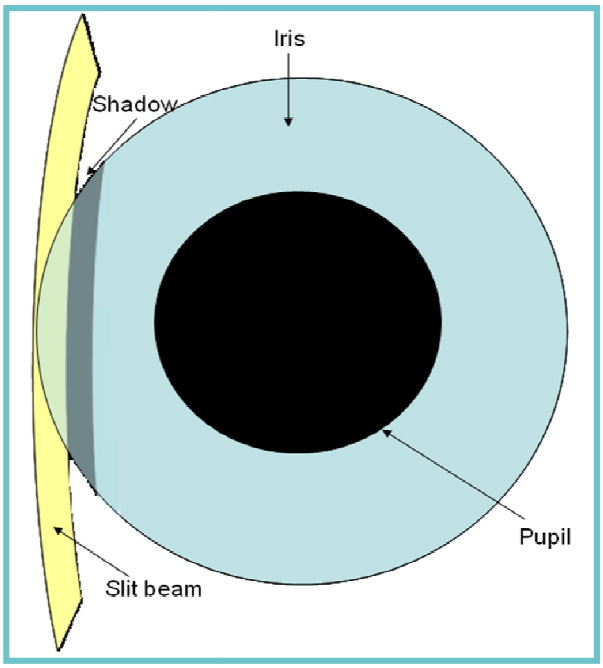
VAN HERICK RATIO

WHAT IS IT AND WHY IS IT USED?	• The Van Herick ratio is an estimation of the depth of the anterior chamber angle; it is an indication of whether the angle is open or closed • If an anterior chamber angle is not open widely, it can mean that a person is at risk of getting closed angle glaucoma • Estimating the Van Herick ratio can help us understand when a person is at risk, so that steps can be taken to minimize the risk of an angle closure – which can lead to vision loss and blindness.
HOW IS IT DONE?	**Preparation** • This test is done using the slit lamp • Set the slit lamp beam width to a small thin slit • Set the slit lamp arm to an angle of 60 degrees temporally (towards the temple) • Set the magnification to a medium setting (about 16x) • Ask the person to look straight ahead • Set the light onto the cornea, at the edge of the temporal limbus (just where the cornea meets the conjunctiva) • You will see one slit lamp beam that is quite bright (this is on the cornea) • Next to it, you will see another fainter light (this is on the iris) • Between the two beams is a darker region • Compare the width of the bright slit lamp beam (which is on the cornea) to the width of the darker region next to it (image on the iris) • The dark region should be LESS than the bright corneal beam • If it is more than the corneal beam, it means you are not right on the limbus, and you need to move the slit lamp more temporally  ***Figure 22-10a: Van Herick ratio to estimate the depth of the anterior chamber angle***

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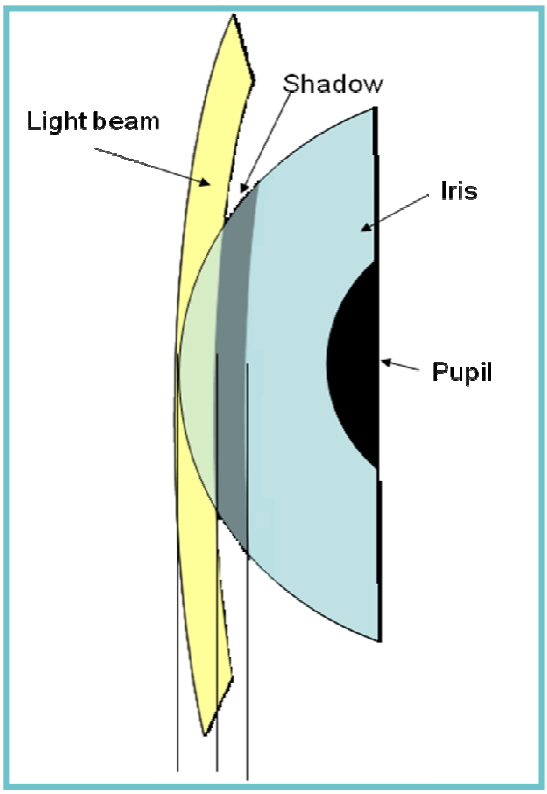

Figure 22-10b: Van Herick ratio – compare the width of the slit beam to the width of the shadow

- Compare the size of the dark region to the bright slit lamp beam
- If it is less than ¼ of the size of the bright slit lamp beam, then the angle is very narrow
- If it is more than ¼ of the size of the bright beam, then the angle is open and we do not need to worry about the angle closing and causing closed angle glaucoma.

HOW DO I RECORD THIS?

- We grade the angle according to the ratio that you see

Grade	Ratio	What does it mean?
4	Greater than 0.5/1	Wide open angle
3	0.27/1 – 0.5/1	Open angle
2	0.26/1	Closed angle glaucoma is possible
1	0.01/1 – 0.25/1	Closed angle glaucoma is likely
0	0.00	Angle is closed

- Record the Van Herick grade that you see
- Remember to do this on both eyes
- Remember to do this for both nasal and temporal angles.

REFERRAL CRITERIA

- Refer anyone with angles of Grade 2 or less
- An angle of Grade 0 indicates a closed angle and requires IMMEDIATE referral!

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GOLDMAN TONOMETRY

WHAT IS IT AND WHY IS IT USED?

- Tonometry is a test to determine the intraocular pressure (IOP) – the pressure in the eye
- It is an important test for diagnosing people with glaucoma
- If the intraocular pressure (IOP) is greater than 20mm Hg in either eye, or if there is a difference in IOP of 2mm Hg or greater between the two eyes, we usually suspect that the person has glaucoma
- The Goldmann tonometer is attached to the slit lamp biomicroscope
- The Goldmann tonometer has a probe, which is able to measure intra-ocular pressure when it is lightly touched onto a person's eye
- Goldmann tonometry can temporarily affect a person's vision, and therefore is usually done towards the end of the eye examination.

Do not perform tonometry on anyone who has an eye infection or a serious eye injury.

Figure 22-11: Goldmann tonometer on slit lamp

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HOW IS IT DONE?

Preparation

- Put the tonometer in place on the slit lamp
- Disinfect the tonometer probe by wiping it with an alcohol swab
- Let it air dry for at least 5 minutes, but not more than 10 minutes

Make sure that the tonometer probe is completely dry before you use it!

- Wash your hands
- While the tonometer probe is drying, place a drop of local anaesthetic into both eyes
- Then place a drop of fluorescein into both eyes

Do not do tonometry if the person is allergic to either the anaesthetic or fluorescein

Procedure

- Make sure the white line on the holder is lined up with the 180 mark on the probe
- Set the measurement dial on 1
- Always start with the person's right eye
- Position the slit lamp illumination arm at about 60 degrees, with the beam wide open and magnification at 16X
- Adjust the slit lamp setting so that the light is blue
- Let the person know that this test will allow you to measure the pressure in their eyes
- Reassure them that, although you will actually touch their eye, it will not hurt
- Ask the person to look straight ahead with both eyes open
- If the person cannot keep their eye open, hold their eyelids open with one hand

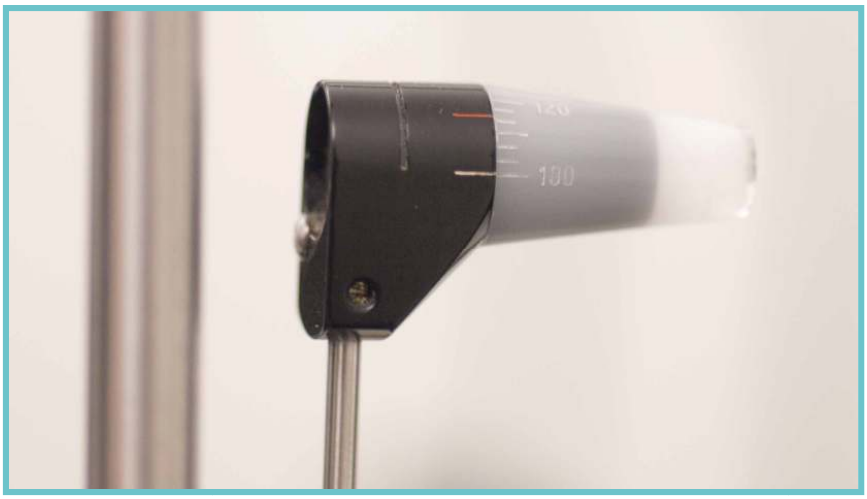

Figure 22-12: Line up the 180 marks on the probe with the white line on the holder

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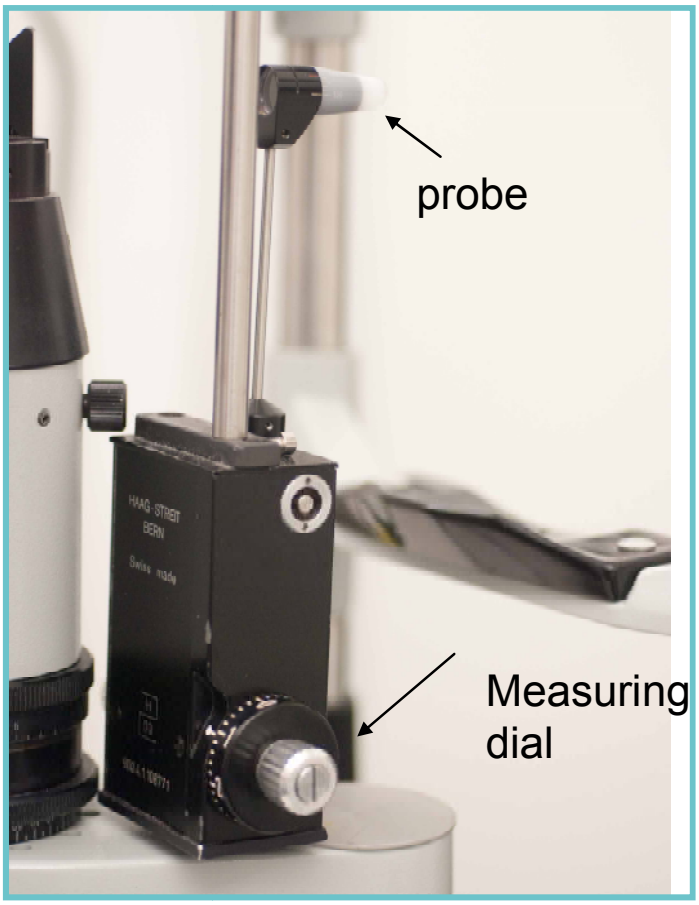

Figure 22-13: Setting the measurement dial to 1

- Slowly bring the probe forward towards the central cornea
- Stop when the probe just touches the cornea
- You will see a glow of light around the limbus
- Look through the eyepieces – you should see 2 bright green semi-circles
- Be sure you do not have too much or too little fluorescein in the eye
- If too much fluorescein:
  - the semi-circles will look very thick
  - remove the probe and ask the person to blink a few times
- If too little fluorescein:
  - the semi-circles will look very thin
  - remove the probe and add a bit more fluorescein

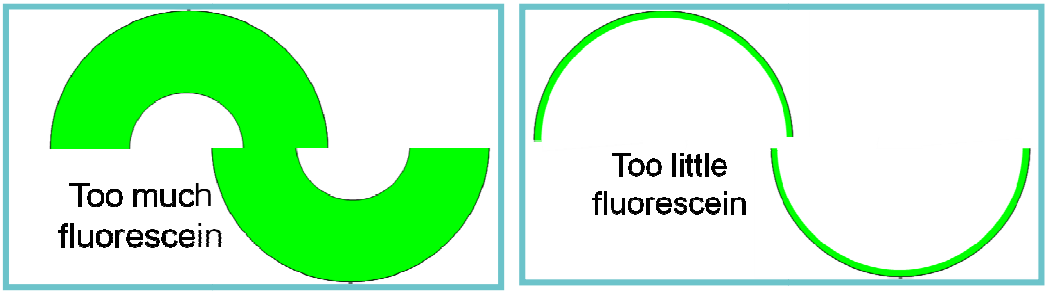

Figure 22-14: Make sure you do not have too much or too little fluorescein in the eye

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- Be sure to position the probe in the centre of the cornea
- You may need to move the prism up or down to view the semi-circles
- Make small adjustments using the joystick until the two green semi-circles are equal in size
- Making small movements on the cornea are acceptable, but be careful not to scrape the entire area
- If large adjustments are needed, pull the probe back and adjust before touching the cornea again

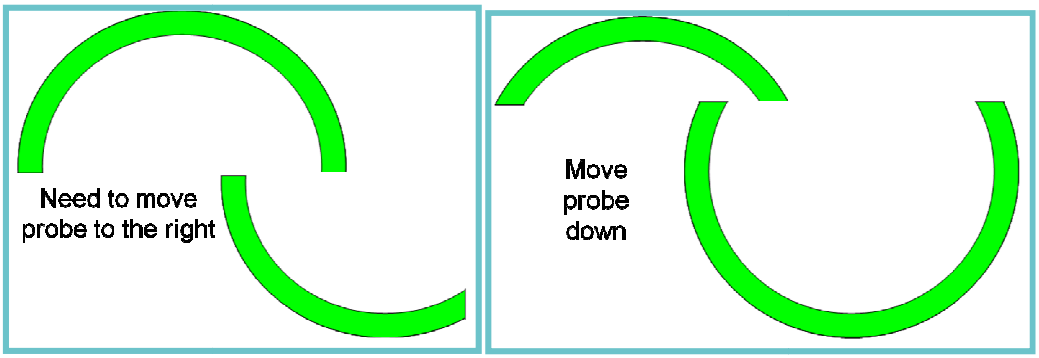

Figure 22-15a: Need to move the probe up or down, left or right to centre it on the cornea

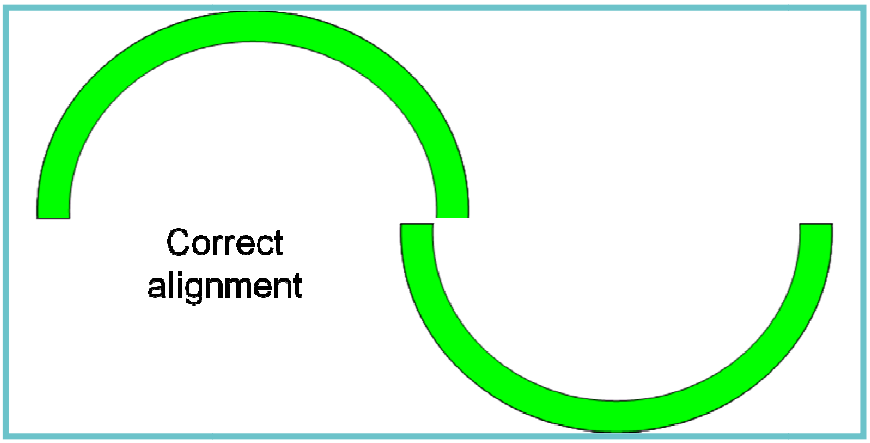

Figure 22-15b: Correct alignment and centration of the semi-circles

- Once the two semi-circles look even, adjust the measurement dial until the two inner borders of the semi-circles touch
- Be careful not to apply too much or too little pressure to the cornea – as this will give incorrect IOP readings
  - If too little pressure – the semi-circles will not overlap
  - If too much pressure – there will be excessive overlap of the semi-circles
- When the semi-circles are properly aligned, you can read the number off the measurement dial
- To get the person's IOP in mm Hg, you need to multiply the number on the dial by ten
- For example, if the dial reads 1, then the IOP is 10 mm Hg
- Repeat for the left eye.

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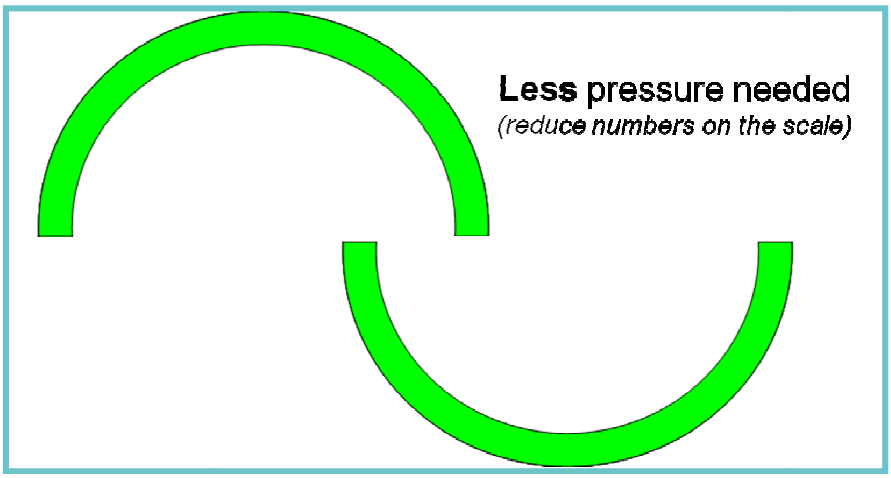

Figure 22-16a: Applying too much pressure (pressing too hard on the cornea)

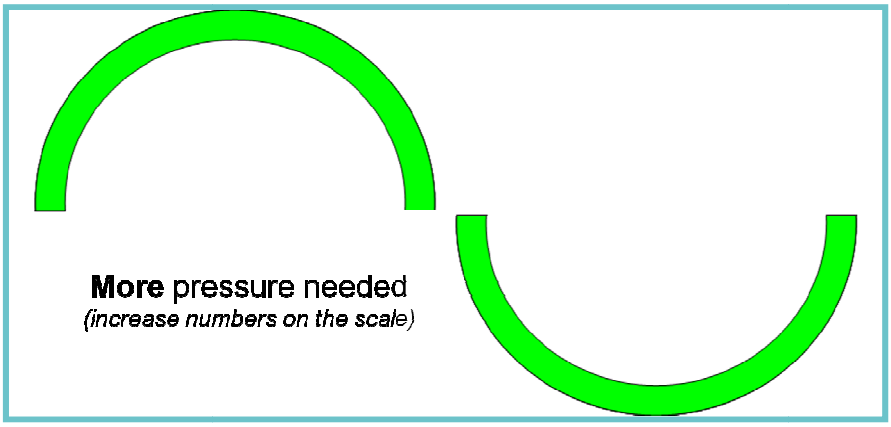

Figure 22-16b: Applying too little pressure (not pressing hard enough on the cornea)

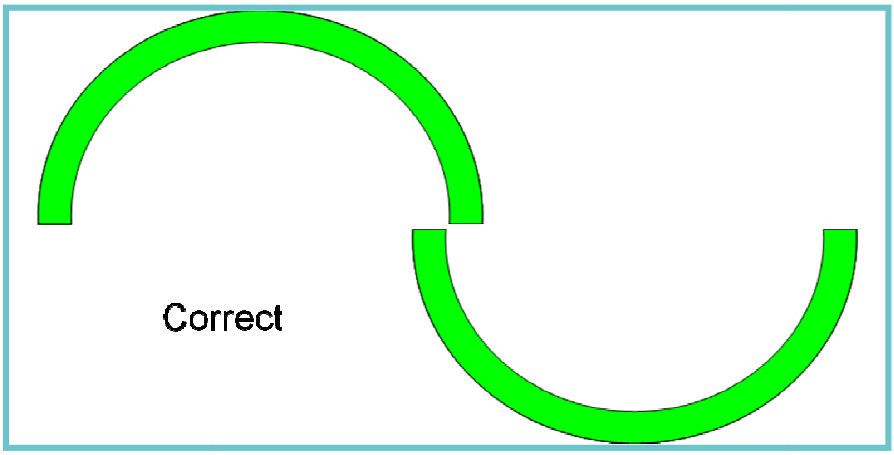

Figure 22-16c: The correct amount of pressure to apply, and correct alignment of the semi-circles

IMPORTANT

You should only perform Goldmann tonometry if you have the knowledge, skills and competency to use diagnostic drugs like local anaesthetic!

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HOW DO I RECORD THIS?	• Intraocular pressure varies with time of the day • When you record intraocular pressure, make sure you record what time you did this • Also, always record the eye. ○ e.g. Tonometry: R 15mm Hg, L16mm Hg @ 11.00am
REFERRAL CRITERIA	• Refer anyone with IOPs over 20mm Hg • Refer anyone with a difference in pressure of 2mm Hg or greater between the two eyes **IOPs over 35mmHg are an URGENT referral!**

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SUMMARY – CLINICAL TECHNIQUES: ANTERIOR EYE

SLIT LAMP BIOMICROSCOPY

- With a slit lamp we can examine the anterior eye
- It allows us to assess the tear film, cornea, conjunctiva, iris and lens
- Refer if any abnormalities of the anterior eye are seen or suspected

HOW TO USE FLUORESCEIN

- Fluorescein is a dye which allows us to examine the cornea, conjunctiva and tear film more closely
- Fluorescein stains damaged cells on the cornea and conjunctiva
- Using fluorescein we can detect dry eye by measuring the tear break up time
- Refer if there is staining on the cornea or if the TBUT is less than 5 seconds

VAN HERICK RATIO

- The Van Herick ratio allows us to assess the depth of the anterior chamber angle of the eye
- Place the slit lamp illumination arm at 60 degrees to the microscope
- Position the slit beam on the limbus, just where the conjunctiva and cornea meet
- Compare the width of the light beam and the dark shadow, and grade accordingly
- A ratio of grade 2 or less indicates a narrow angle and should be referred

GOLDMANN TONOMETRY

- Tonometry is a way of measuring the pressure inside the eye (intraocular pressure)
- If the pressure in the eye is too high, it can indicate the presence of glaucoma which can lead to permanent vision loss
- You need to use local anaesthetic and fluorescein to do tonometry
- The Goldmann tonometer is attached to a slit lamp
- Place the tonometer probe on the cornea
- Line up the semi-circles so that their inside edges are touching and measure the intraocular pressure (IOP)
- Refer if the IOP is greater than 20 in either eye
- An IOP above 35mmHg is an urgent referral

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TEST YOURSELF QUESTIONS

1. **How would you check for a foreign body underneath the eyelids?**

_____

_____

2. **What parts of the eye can you examine with a slit lamp?**

_____

_____

_____

3. **What is your referral criterion for the following tests?**

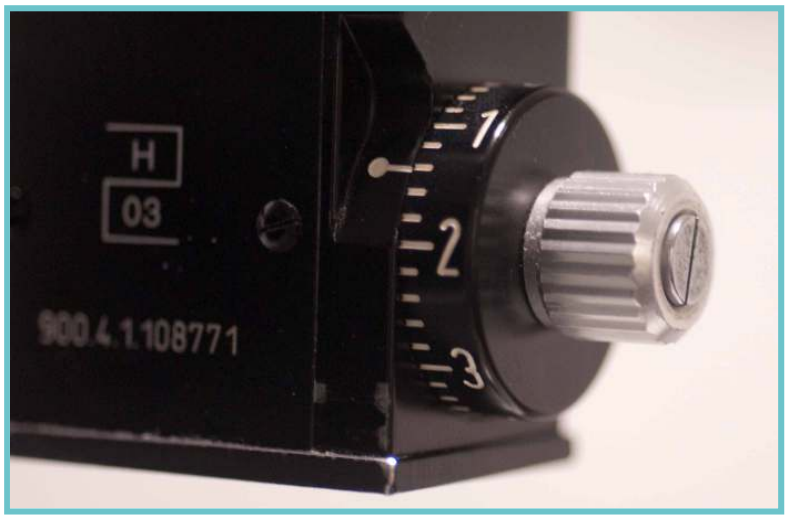
Test	When should you refer?
Goldmann Tonometry	
Van Herick ratio	

4. **Name two situations where you should NOT do Goldmann tonometry:**

_____

_____

5. **You measure someone's intraocular pressure, and the number on the dial is as shown below. What is their intraocular pressure?**



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