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The next step: detailed assessment of an adult glaucoma patient

**Van Herick’s technique, step by step**

1. **Identify the cause of increased IOP**
2. **Quantification of the level of glaucoma damage and functional impairment.**

Although there are many possible causes of glaucoma (e.g. trauma, inflammation, previous surgery, or an inherited tendency), it is usually possible to identify the mechanism of elevated IOP by careful history taking, anterior segment examination, and optic disc assessment using a slit lamp.

After assessment, the clinician can group the glaucomatous optic neuropathies into three main categories: primary open-angle glaucoma (POAG), primary angle-closure glaucoma (ACG), and secondary glaucomas (including pseudo-exfoliation, pigmented, uveitic, lens-induced, neovascular, steroid-induced and traumatic).

As a group, the glaucomas are chronic, life-long diseases, and it is therefore essential to collect and record clinical data accurately so that patients with progressive disease or who develop other ocular pathology can be identified at an early stage.

**History**

Taking a careful history helps in two ways:

- **Identification of the cause of increased IOP**
- **Quantification of the level of glaucoma damage and functional impairment.**

The next step: detailed assessment of an adult glaucoma patient

**Introduction**

The glaucomas are a group of progressive optic neuropathies associated with characteristic structural changes at the optic nerve head (cupping) and corresponding visual field defects. The main modifiable risk factor for glaucomatous optic neuropathy is increased intraocular pressure (IOP). The aims of assessment are:

- **Accurate diagnosis**
- **Identification of the cause of increased IOP**

If applicable

1. **Identification of risk factors for glaucoma and glaucoma progression.**
2. **Identification of medical and social factors critical to optimum glaucoma management.**

**Risk factors for glaucoma**

- **High IOP**
- **Age**
- **Ethnicity (African: POAG, Asian: ACG)**
- **Positive family history of glaucoma**
- **Refractive status (myopia and hypermetropia)**
- **Previous ocular trauma**
- **Previous intraocular inflammation**
- **Previous ocular surgery**
- **Steroid usage.**

**Risk factors for disease progression**

- **Family history of glaucoma blindness**
- **Severe visual loss at presentation**
- **Previous history of high IOPs.**

**Medical factors in glaucoma management**

- **Contra-indications to medications.** For example, topical beta-blocker therapy (such as Timolol) is contra-indicated in people with asthma, chronic pulmonary

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**Further reading**

There are two types of indirect goniolenses. The Goldmann lens needs a coupling fluid. When indenting, the patient has to look towards the mirror. It gives clear views of 360° of angle with rotation. The four-mirror goniolens does not require a coupling fluid. Indentation can be performed in primary gaze, but the lens is unstable on the cornea. Corneal folds therefore develop easily and may reduce the clarity of angle structures.

1. Gonioscopy needs to be done in a dark room with a short slit lamp beam. Shining the beam directly into the pupil should be avoided, as this may change the angle configuration, changing a narrow angle to an open configuration.

2. The mirror is placed at 12 o’clock in order to visualise the inferior angle, which is usually more open.

3. Angles are best graded from anterior to posterior. An anterior landmark which serves as a starting point is Schwalbe’s line: the end of Descemet’s membrane between the corneal endothelium and trabecular meshwork. It can be located with the optical corneal wedge: if a narrow slit beam is tilted showing the cornea in full thickness, the reflections from the anterior and posterior surfaces of the cornea meet at Schwalbe’s line.

4. The goniolens is then rotated to view 360° of the angle.

5. If the iris has a convex configuration and obscures angle structures then the patient can be asked to look towards the mirror.

6. Indentation is helpful if the angle is narrow or closed. If the angle is closed by adhesions, it will not open on indentation (synechial closure). If the angle is closed only by apposition, it will be forced open and reveal the recess on indentation.

Gonioscopy, step by step

Figure 3. Cross-section of the chamber angle. Abbreviation: TM: trabecular meshwork

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Figure 4. Open chamber angle of an African patient viewed with a gonioscope

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Table 1. Standardised glaucoma assessment tool. Abbreviations: XFG: pseudoexfoliation glaucoma; PG: pigmentary glaucoma; UG: uveitic glaucoma; LG: lens-induced glaucoma; NG: neovascular glaucoma; TG: traumatic glaucoma; OSD: ocular surface disease.

<table>
<thead>
<tr>
<th>What to examine?</th>
<th>Why?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Right eye</strong></td>
<td><strong>Left eye</strong></td>
</tr>
<tr>
<td><strong>Visual acuity:</strong></td>
<td>If a reduced visual acuity does not improve after refraction, it is commonly due to cataract or very advanced glaucoma. Alternative or co-pathology must be ruled out</td>
</tr>
<tr>
<td>Uncorrected</td>
<td></td>
</tr>
<tr>
<td>Pinhole</td>
<td></td>
</tr>
<tr>
<td>With correction</td>
<td></td>
</tr>
<tr>
<td><strong>RAPD</strong></td>
<td>Asymmetric glaucoma, previous trauma or inflammation of the anterior segment causing posterior synechiae.</td>
</tr>
<tr>
<td>Anisocoria</td>
<td></td>
</tr>
<tr>
<td>Pupils</td>
<td></td>
</tr>
<tr>
<td><strong>Lid margin</strong></td>
<td>Blepharitis, dry eye as part of OSD</td>
</tr>
<tr>
<td><strong>Conjunctiva</strong></td>
<td>Papillae, Follicles, Inflammation, Oedema, cicatrical disease, vernal keratoconjunctivitis, Bitot’s spot, pterygium, conjunctival growth causing ocular surface disease</td>
</tr>
<tr>
<td><strong>Cornea</strong></td>
<td>Oedema, scars (TG?), infiltrates, keratic precipitates (UG), central vertically distributed pigment deposits on the endothelium (Krukenberg spindle) (PG)</td>
</tr>
<tr>
<td><strong>Anterior chamber</strong></td>
<td>Depth (van Herick), cells (inflammation) (UG), hyphema, vitreous (TG)</td>
</tr>
<tr>
<td><strong>Iris</strong></td>
<td>Transillumination defects (PG), white flake-like material on the pupillary border, absent pupillary ruff, poor dilatation (XFG), pigment dispersion (PG, XFG), heterochromia, iris nodules, posterior synechiae, atrophy, anisocoria (UG), Neovascularisations of the iris (UG, NG)</td>
</tr>
<tr>
<td><strong>Gonioscopy</strong></td>
<td>Increased trabecular pigmentation (XFG; PG), debris and peripheral anterior synechiae (UG), fine white protein deposits (LG), trabecular neovascular membrane or fine neovascularisations (NG), angle recession, ghost cells, retained foreign body, cyclodialysis cleft (TG). Angle closure.</td>
</tr>
<tr>
<td>1° position</td>
<td></td>
</tr>
<tr>
<td><strong>Lens</strong></td>
<td>Luxation (TG), irido-phacodonesis (XFG), large lens, hypermature cataract (LG)</td>
</tr>
<tr>
<td><strong>Optic nerve head</strong></td>
<td>Vertical cup-disc ratio, position of vessels, macular degeneration, diabetic retinopathy, retinal detachment, hypertensive retinopathy</td>
</tr>
<tr>
<td>Macula</td>
<td></td>
</tr>
<tr>
<td>Periphery</td>
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to assess it in cases of suspected glaucoma. Gonioscopy contributes answers to two questions:
1. What type of glaucoma is it?
2. What is the risk of angle closure?
See the panel on page 51 for practical instructions. The morphology of the chamber angle can be classified using several systems. For example, the Shaffer classification grades morphology from 4 to 0, where:

- **Grade 4**: ciliary body band visible, angle wide open
- **Grade 3**: scleral spur can be identified
- **Grade 2**: trabecular meshwork is visible, angle closure is possible but not very likely
- **Grade 1**: only Schwalbe’s line visible, high risk for angle closure
- **Grade 0**: angle closure due to iridocorneal contact.

Other important signs are peripheral anterior synechiae, which occur when the peripheral iris adheres to the trabecular meshwork. Peripheral anterior synechiae should not be confused with iris processes, which usually do not cross the scleral spur. Other features to look for are iris or angle neovascularisation, angle recession, cleft, and pigmentation. The angle should be documented in four quadrants. If there is angle closure, additional manoeuvres such as asking the patient to look towards the mirror or intendation will give additional information (e.g., the presence of a plateau iris configuration or synechial closure).

**Tonometry**
Accurate IOP measurement together with optic disc assessment is the backbone of diagnosis and management of glaucoma. IOP can be measured with applanation tonometry; this is still the gold standard, but it is difficult to get accurate readings unless the examiner is experienced. The applanation tonometer also needs to be calibrated regularly. Other instruments for measuring IOP include the Schiotz tonometer, the tonopen, and the non-contact ‘airpuff’ tonometer. Rebound tonometry may be also an alternative if applanation tonometry is not available, and is very useful in children or at mobile clinics.

Normal IOP is below 21 mmHg. However, be aware that patients who return for follow-up visits may remember to use their eye drops just before they come to the clinic, so that the assessed IOP appears to be controlled. This means that the optic disc and visual fields must also be assessed; do not rely on IOP alone.

**Ophthalmoscopy of the optic disc**
Glaucomatous changes to the optic nerve head are central to diagnosing glaucoma and its progression. See page 55 for a detailed guide to identifying a glaucomatous optic nerve head.

**Summary**
Identifying and documenting the cause of glaucoma, as well as the resulting structural changes and functional loss, are key steps in assessing a patient with glaucoma. They allow the clinician to determine if there are any specific modifiable factors and provide information on the severity of the disease to guide the management decisions.

**References**

**Further reading**

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