

Gonioscopy is an examination usually performed in a sitting person at the slit lamp (Fig. 2.1). Only during glaucoma surgery or for examinations under general anesthesia in babies or in sedated infants does the patient lie in a supine position (Fig. 2.2).

2.1 Lenses

The structures of the chamber angle are only visible with lenses put on the eye, because light rays coming from the chamber angle are totally absorbed by inner reflections by the cornea. The lens on the cornea has a higher refractive index than the cornea and the tear fluid.

For surgery the surgeon may use a very thick, convex lens for *direct* gonioscopy (a Koeppe lens, or a Swan Jacob lens; Fig. 2.3).

Indirect gonioscopy as a routine examination is performed with lenses that have a different numbers of mirrors located at variable angles. The Goldmann three-mirror lens is the best known and most popular one. For gonioscopy the smallest mirror with the steepest angle is used. All these lenses have a diameter larger than that of the cornea (15 mm in adults). The curvature of the lenses is steeper than that of a regular cornea, so some contact gel (methylcellulose) is needed between the lens and the cornea.

Lenses for *dynamic* or *indentation* gonioscopy have a smaller diameter than that of the cornea (9 mm). Their curvature is (almost) the same as that of a regular cornea so no contact gel is needed for examination. They are indispensable for

differential diagnoses in angle-closure pathologies (Figs. 2.4 and 2.5).

2.2 Regular Procedure

Always explain to the patient what you are going to do!

Always examine both eyes!

First anesthetize the eyes with a drop of topical anesthetic applied into the cul-de-sac of the lower conjunctiva. Use enough contact gel on the concave part of the lens, fill up that hollow and avoid air bubbles. Ask the patient to open both eyes and to look upwards, take a cotton-stick to pull the lower lid downwards (Fig. 2.6) and place the lens



Fig. 2.1 Patient sitting at the slit lamp for gonioscopy (Goldmann three-mirror lens)

gently with its lower edge into the lower cul-de-sac, then tilt the lens with the contact fluid onto the cornea (Fig. 2.7). Sometimes the upper lid interferes in patients who squeeze their lids and you have to repeat the procedure.

Ask the patient to look straight ahead. Remember, the part of the chamber angle that you examine is 180° away from the position of the mirror you use.



Fig. 2.2 Baby lying under a microscope in the operating room for gonioscopy (Koeppel lens). The microscope is tilted to 45° to get a good view of the structures of the angle

Start with the inferior angle (Fig. 2.8)!

The superior angle is always a bit narrower than the inferior angle, probably due to the pressure of the upper lid. The pigmentation of the inferior angle is usually more prominent due to hydrostatics. Therefore, it is easier to identify the structures in the inferior angle. Rotate the lens to bring the smallest mirror to the 12 o'clock position. Then adjust the slit lamp to 0° and examine the chamber angle clockwise (better than counter-clockwise, because you will remember the pathological changes according to the clock hours more easily). Start with low



Fig. 2.3 Lenses for direct gonioscopy: Koeppel lens (*left*), Swan Jacob lens with handle (*right*)

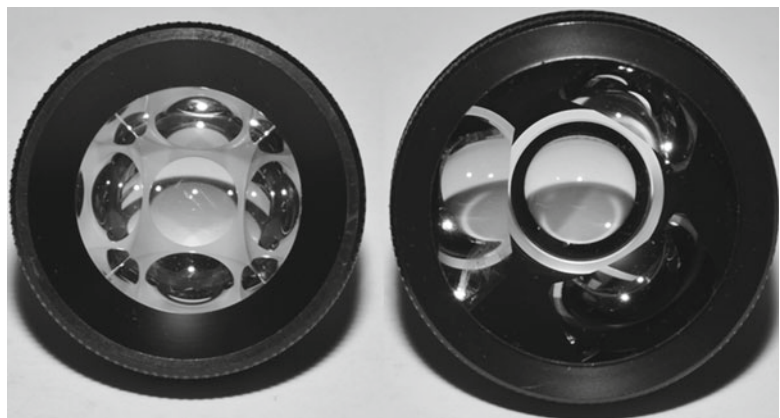


Fig. 2.4 Lenses for gonioscopy: Sussman four-mirror lens for dynamic gonioscopy (*left*), Goldmann three-mirror lens for regular gonioscopy

Fig. 2.5 Sussman lens with a diameter smaller than the cornea and a Goldmann lens with a diameter larger than the cornea (*upper scale millimeters, lower scale inches*)

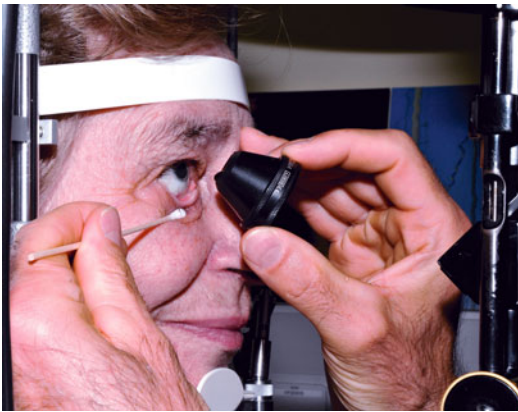


Fig. 2.6 The patient is asked to look upwards. A cotton stick is used to pull down the lower lid and the lens is placed gently with its lower edge in the lower cul-de-sac



Fig. 2.7 The lens is tilted with the contact fluid onto the cornea

magnification and change to a higher one if you want to see more detail.

Be sure to keep in mind your findings and document them correctly. After you have finished your first 360° examination, perform a second

Fig. 2.8 The smallest mirror of the Goldmann three-mirror lens is at the 12 o'clock position, ready to examine the inferior angle

examination with different magnifications and/or light conditions. Start with a bright beam to get an overview, use a narrow beam for the corneal “wedge” to identify Schwalbe’s ring. Dim the light in a narrow angle, otherwise constriction of the pupil will pull out the iris from the angle so that the angle appears wider than it really is.

At the end of the examination ask the patient to squeeze the lids firmly. The lens will come off the cornea easily. Afterwards you should wash out the remnants of the contact gel of the eye with saline solution. The lens should be properly sterilized for the next patient.

Try to perform your first gonioscopies under the supervision of an experienced person via the

second tube of the slit lamp or via videotaping, and discuss your findings.

In a narrow angle, you can ask the patient to look towards the direction of the steepest mirror. You keep the lens in the frontal position without a tilt. Now the beam will go over the iris and into the angle for a more detailed view. In addition, the margin of the lens will provide some pressure on the cornea or limbus and will push the aqueous humor into the opposite part of the angle. Therefore this part will become slightly wider than it really is. Keep this in mind!

2.3 Dynamic or Indentation Gonioscopy

In eyes with a closed angle you have to distinguish between an iridotrabecular contact (ITC, apposition) and peripheral anterior synechiae (PAS). The proper therapy depends strongly on these findings.

For better differentiation, the use of a lens with a smaller diameter than the cornea (9 mm) is mandatory. There are lenses with and without a handle. Try both types and decide which you prefer. Anesthetize the eyes and wait for a short while. Because the lens has a smaller diameter and a curvature similar to that of the cornea, no contact fluid is needed. Ask the patient to look straight ahead and put the lens gently on the surface of the cornea. You do not have to rotate it, because all four mirrors have the same angularity. To get a 360° view you only have to change the position of the slit beam (Fig. 2.9).

Initially you may not find all of the structures of the chamber angle because the iris is bowed forward. You may be able to identify Schwalbe's ring and the anterior parts of the trabecular meshwork (Shaffer grade 2). Indentation of the globe by applying gentle pressure to the cornea will change the fluid compartment in the anterior chamber and will widen the angle. An ITC or apposition will open and you will be able to see more detail of the chamber angle. A synechia will remain unchanged and the chamber angle will stay the same in that particular part (Figs. 2.10 and 2.11).

Examine the chamber angle with all four mirrors and document your findings. It makes an



Fig. 2.9 Indentation or dynamic gonioscopy with a lens of contact diameter less than the cornea. Contact fluid such as methylcellulose is not necessary because the curvature of the lens and the cornea are the same

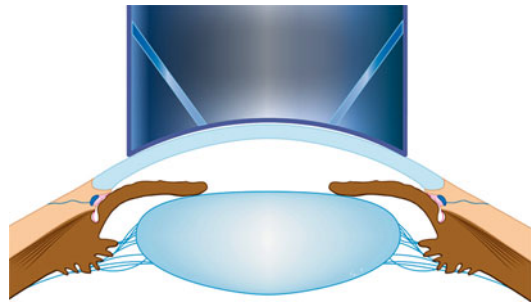


Fig. 2.10 Schematic drawing showing a closed angle due to contact of the iris to the trabecular meshwork before indentation gonioscopy with a lens of diameter smaller than the cornea

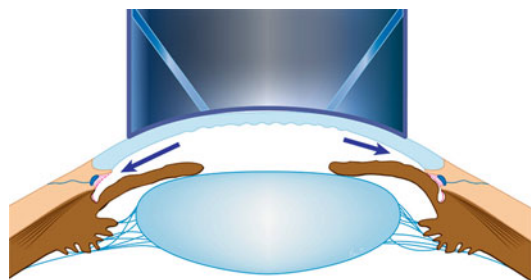


Fig. 2.11 Schematic drawing showing the chamber angle during indentation gonioscopy: the ITC has opened (*left angle*), the synechia remains unchanged and closes the angle (*right angle*)

important difference to the therapy if less or more than 270° is closed or not. If the applied pressure is too high, corneal folds will appear and will worsen

your view. Therefore, practice applying pressure since an understanding of how much pressure to apply has to be gained by experience. Be very gentle and do not forget: you have to see clearly.

If you use a lens with a larger diameter than that of the cornea you may also “indent” the cornea and open some parts of the angle. If the patient does not look straight ahead, the rim of the lens will indent the cornea and some aqueous humor will be displaced. The part of the angle opposite the indentation will get wider. The same effect is possible if you as the examiner tilt the lens some degrees out of the central axis. Unintended indentation may artificially open an angle! One sign of indentation are striae of the cornea, as mentioned above.

2.4 Surroundings

Gonioscopy should be performed in a relatively dark room. Otherwise the consensual pupillary reaction will constrict the pupil of the examined eye. Therefore, a room with a low light level is recommended. You may start with a brighter beam to get an overview of the angle structures. Afterwards reduce the brightness and the size of the slit beam. Use a short (2–3 mm), not too wide (1 mm) and not too bright slit beam. Otherwise ITCs (appositions) cannot be diagnosed correctly, and may be missed. And you would miss the need to perform neodymium:yttrium-aluminum-garnet (Nd:YAG) laser iridotomy. Perform “dark room gonioscopy” in all eyes with a suspicion of angle-closure disease and in all eyes in which the van Herick test is suspicious for possible angle closure. In addition, you may probably find hidden signs of other diseases such as neovascularizations or increased pigmentation.

2.5 Tonometry or Gonioscopy: Which First?

Always perform tonometry first. The pressure during gonioscopy may reduce the intraocular pressure artificially. The anesthetic compound in fluorecain eye drops for tonometry will be sufficient to do gonioscopy afterwards.

2.6 Importance of Gonioscopy

Glaucoma is not the only pathology that should point you towards examining the chamber angle by gonioscopy. There are many other pathologies changing the configuration of parts of the angle, such as tumors that will never lead to glaucoma. A foreign body may be hidden behind the peripheral cornea and the patient only remembers a “second of pain”, has no blurred vision and no red eye (Figs. 2.12 and 2.13).

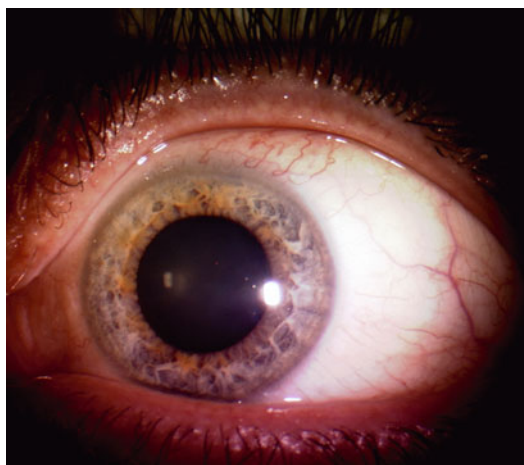


Fig. 2.12 Right eye after a penetrating injury. The patient was not aware that a foreign body had entered his eye. There is only a low grade conjunctival redness superiorly and there are no signs of an intraocular foreign body on slit lamp examination

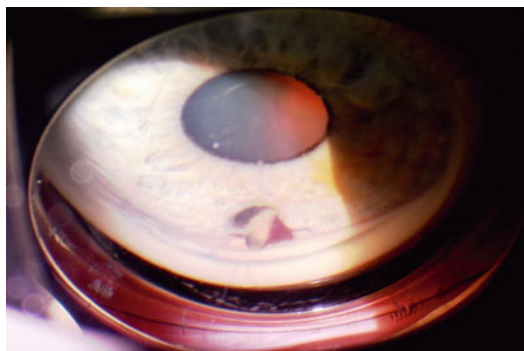


Fig. 2.13 Same eye as shown in Fig. 2.12. Gonioscopy revealed an encapsulated foreign body with a peripheral coloboma at 12 o'clock. The foreign body was extracted using a magnet

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