NEVYAS OPERATIVE KERATOMETER / FIXATION SYSTEM
INSTRUCTIONS FOR USE

The Operative Keratometer/Fixation System is an advanced fixation system which consists of a moveable fixation light to allow precise directing of patient gaze for procedures performed under topical anesthesia integrated with a built-in qualitative operative keratometer. The fixation light may be set to a steady or flashing mode.

This fixation target is particularly useful for refractive surgical procedures and for cataract surgery to find the true visual axis for centration of a procedure around it, to direct the patient's fixation to the optimal position at each stage of the procedure and to keep the microscope light off the fovea. The keratometer is very useful for finding and confirming the steep axis of astigmatism before performing any surgery which would have an astigmatic effect, and for facilitating controlled accurate astigmatic keratotomy.

HOW TO DETERMINE THE TRUE VISUAL AXIS

For refractive surgery, many surgeons prefer to identify the patient's visual axis for centration of the procedure. Once the surgeon knows the location point of the intersection of the visual axis with the corneal surface, the surgeon can either use that point for the center of the surgery or can compromise as desired between that and the pupillary center.

In order to line up the patient's fovea, the visual axis intersection point at the cornea and the observer's fovea:

1) Move the rotatable fixation light to either the 3 o'clock position (if you prefer to use your right eye) or the 9 o'clock position (if you prefer to use your left). The surgeon then closes his/her non-preferred eye.

2) Observe with your preferred eye while moving the fixation target in from the periphery to the center until the blurred image of the light carrier is noted approximately centered in the field of that eye's ocular. If the red LED of the fixation target is turned on, a red glow will help the surgeon to center the target.

3) Direct the patient to look precisely at the red light. The point where the image of the light is seen on the cornea then represents the corneal point on the visual axis.

4) This point can be marked directly on the cornea, or (to avoid indenting the corneal center) a CK point marker, zone marker or astigmatic arcuate marker can be centered around it and the cornea marked with it. (For some surgeons, it is easier to lower the marker almost to the cornea using binocular vision and then to close the surgeon’s non-preffered eye for the final centration of the marker and placement on the cornea.)

5) Then move the fixation light away from the center and place it where you wish the patient to fixate to facilitate the next part of the surgical procedure.

A Faster Way

If the fixation light is simply pushed in all the way so that it is centered in the keratometer ring light, its reflection is adequately close to the visual axis intersection for astigmatic keratotomy and limbal relaxing incisions. The surgeon views binocularly to mark the cornea.

MOVEMENT OF THE FIXATION TARGET LIGHT

The fixation light can be positioned anywhere within the circle of the keratometer ring. When the fixation light is pushed all the way in from any position, it will stop at the center of the keratometer ring. When the fixation light is moved away from the microscope light, the patient can visualize it better. The patient's fovea will then be protected from light damage from the microscope filament image during surgery, and the patient will be able to maintain his gaze on the fixation light more easily then when it is positioned close to the microscope light.

The fixation light can be grasped by its sterilizable handle and positioned where the surgeon wishes the patient to look. It is particularly useful toward 6 o'clock where it can help the patient to maintain gaze downward and thereby make it easier for the surgeon to operate at 12 o'clock in cataract surgery and to perform superior cuts during radial or astigmatic keratotomy. For astigmatic keratotomy at 3 or 9 o'clock, the fixation light can be directed to either side in order to allow the surgeon to visualize better the diamond blade. The instrument is provided with sterilizable aluminum handles for the fixation light mounting and sterilizable silicone covers for the switches.

The two toggle-switches are located conveniently toward the surgeon's right hand. The upper switch is a two position on-off switch for the operative keratometer ring light. The lower switch is a three position switch for the fixation light. The center position is "off." The fixation light may either be turned on steadily or set flashing with the other two positions. With this switch toward the surgeon, the light is on steadily; with the switch away from the surgeon, the light flashes. The steady light is adequate for most purposes, but if it is necessary to obtain the cooperation of an inattentive patient, setting the light to the flashing mode will help to attract and maintain his attention.

THE OPERATIVE KERATOMETER

A qualitative operative keratometer is built into this instrument in the form of a ring of red LED's. It can be switched on to obtain a reflection from the central cornea. This reflection is particularly helpful with refractive surgery when one may wish to confirm the direction of astigmatism before placing astigmatic cuts in order to avoid the possibility of a "90 degree error." One also can estimate the amount of correction obtained at surgery immediately after each cut to provide a degree of ongoing keratometric control of the procedure.

By enlarging arcuate cuts by degrees and checking the keratometer reflections between cuts, one can attain adequate correction and avoid overcorrection.

In cataract surgery, where one wishes to place the incision across the steeper meridian to reduce astigmatism, this instrument will confirm the true location of the steeper meridian (along the short axis of the reflected ellipse). Such confirmation helps to prevent axis errors obtained in preoperative measurement, in operative measurement and from cyclotorsion of the globe when lying down, where there is a degree of astigmatism adequate to create a noticeable ellipticity of the reflection (usually 1.5 diopters or more).

Having a ring of evenly spaced LED's rather than a continuous line of light gives the surgeon another clue to the direction of the long axis of the elliptical reflection since the reflections of the LED's are crowded closer together at the ends of the ellipse (parallel to the flatter axis of astigmatism) and are further apart at the center of the ellipse (parallel to the steeper axis of astigmatism).

A TECHNIQUE FOR USING THE MOVEABLE FIXATION LIGHT AND QUALITATIVE KERATOMETER IN ASTIGMATIC KERATOTOMY

The patient's fellow eye is covered so that the patient fixates only with the eye to be operated. The moveable fixation light is pushed all of the way in so that it is centered in the keratometer ring.

When the patient is looking directly at the fixation light, the light ring of the operative keratometer is turned on, and its elliptical reflection is observed. The true axis of astigmatism is confirmed. (This may be somewhat different from the astigmatic axis measured with the Mendez operative protractor when sitting up, as the eye usually undergoes torsion when the patient lies back.) When observing the elliptical reflection, it may be helpful to lift the lid speculum away from the globe in order to eliminate its deformation of the globe.

The steep meridian of astigmatism (the short axis of the ellipse) is noted, and the cornea is marked with the appropriate arcuate marker at this meridian.

The fixation light is then moved to direct the eye to a position which improves the surgeon's view and thus facilitates incising along one of the astigmatic arcuate marker impressions. Then the fixation light is moved again to facilitate incisional surgery along the other arcuate marker impression.

The moveable fixation light is centered again, and the patient is directed to fixate on it. The speculum is lifted slightly away from the globe, the keratometer is turned on, and ellipticity of its reflection is again observed. If the reflection is close to circular, the end point has been reached. If it retains a significant amount of its previous ellipticity, then more surgery may be performed by re-deepening the incision or by extending slightly one or both of the ends of one or both of the keratotomy incisions, depending upon the degree of remaining ellipticity and its axis.

These extending cuts are made one at a time, and between cuts this same process is repeated wherein the patient fixates centrally while the keratometer reflection is observed. In each case the fixation light is then repositioned in order to have the patient move his/her eye to the optimal position for the appropriate extension of the keratotomy cut.

In this way the instrument's use involves a repeated series of three steps:

1. Fixation of the patient's eye on the centered fixation light.
2. Qualitative keratometry with the ring light.
3. Off-center fixation to facilitate surgery and also to facilitate the patient's fixation by removing the fixation light from the immediate vicinity of the microscope light.

The sequence is repeated until adequate corneal sphericity is obtained.

TECHNIQUE FOR USING THE MOVEABLE FIXATION LIGHT

IN MARKING THE CORNEA FOR CK

The patient's non-operative eye is occluded. The surgeon's non-preferred eye is occluded by closing. The fixation light is centered in the surgeon's optical field for his/her dominant eye. The light is set either steadily on or blinking. The small fixation light will be seen by the surgeon as a shadow which does not totally occlude any of the field through the operating microscope. It may be set to blinking or kept on steadily. The red glow will help the surgeon to center it in his field. The patient is instructed to direct his operative eye to the fixation light. The inked marker is then centered over the patient's pupil and placed onto the cornea to mark it. (For some surgeons, it is easier to lower the marker almost to the cornea using binocular vision and then to close the surgeon's non-preffered eye for the final centration of the marker around the pupil and placement on the cornea.) The surgeon's closed eye is opened, and the placement of the coagulation spots is performed binocularly with the operating microscope.