

# B-HEX® Pupil Expander: Tips & Tricks



“It is essential to have good tools, but it is also essential that the tools should be used in the right way.” **Wallace D. Wattles**

The ‘B-HEX Pupil Expander’ has enabled easy and safe Phaco surgery in eyes with non-dilating pupils. This, in turn, has translated into better visual outcomes.

In an online survey in August 2020, it was heartening to see that despite its higher cost, the ‘B-HEX Pupil Expander’ was preferred over ‘Iris hooks’. While 91% of responders were happy using the B-HEX, 68% of these had even happily recommended it to colleagues. While 2% were undecided, the unhappy 7% were a source of concern. Analysis of what was done differently by the happy or unhappy users revealed that the happy ones were using the recommended ‘B-HEX 23 G forceps’ while the unhappy ones were using a ‘Sinsky hook’. The happy users were also following the usage instructions to identify and stretch the rigid pupil before using the B-HEX, while a majority of unhappy ones were not.

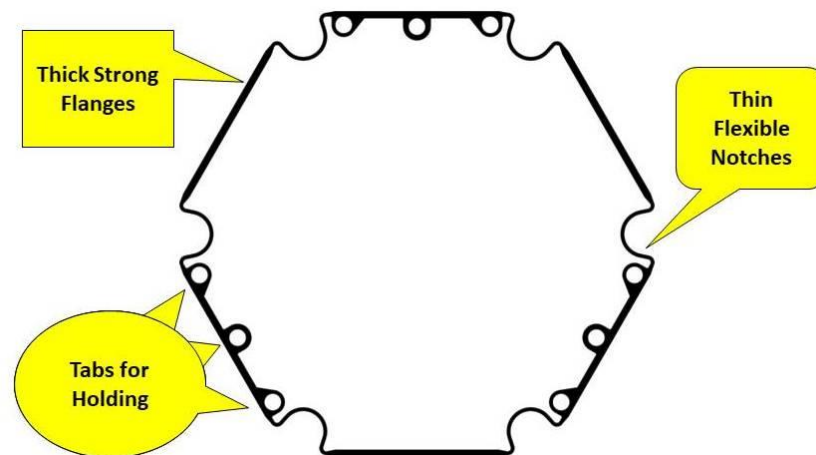
We gratefully acknowledge the inputs of the survey participants and feedback from colleagues in the form of suggestions and clarifications. These usage tips and tricks will ensure that **every user has a great ‘B-HEX experience’**.

It is essential to be familiar with the strengths, limitations and recommended techniques to harness the potential of this innovative device.

## Strengths:

1. **Hair thin profile:** The 75 micron (0.075 mm) profile of B-HEX allows it to be easily slid in through a 1.5 mm incision and slid out of a 1.0 mm side-port incision. It stays away from the endothelium and does not obstruct movement of the phaco probe, side port instruments and IOL cartridge nozzle. This is of immense value in shallow anterior chambers.
2. **Super Flexibility:** Its unique resiliently flexible property allows easy manipulation. Hence, it is gentle on the pupil margin and iris and leaves a round pupil on removal.
3. **Perfect Control:** Since the flanges are held and tucked with the B-HEX 23 Gauge forceps, the control is at the site of action. This is in contrast to a device delivered with an injector where the control is more remote and away from the site of action.

4. **Simple design:** Allows easy insertion, engagement & removal techniques requiring no learning curve or hands on demonstration. Just viewing a few videos is sufficient.



5. **Reusable B-HEX<sup>®</sup> 23 Gauge forceps:** As a reusable accessory, it reduces the cost and makes the device affordable.



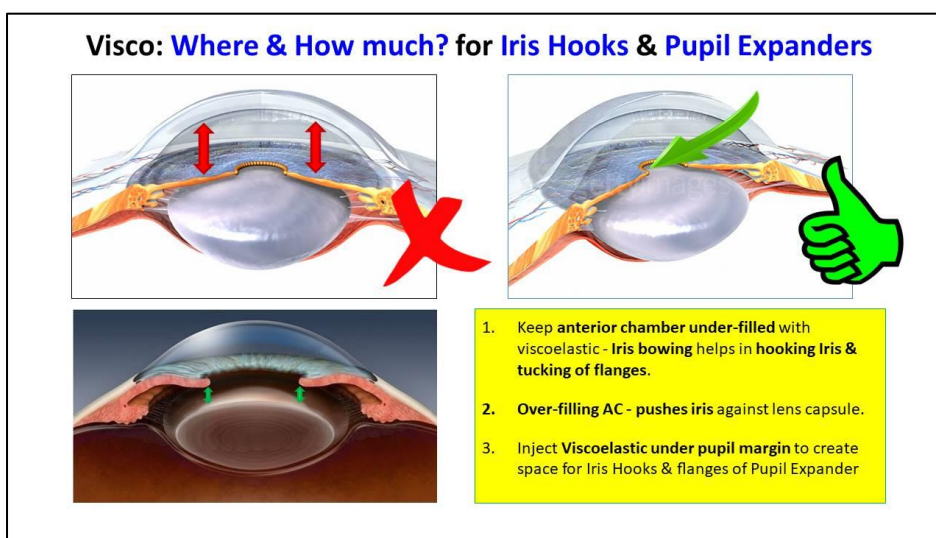
Genuine **B-HEX<sup>®</sup>** Mark

### Limitations:

1. **Low Mechanical Strength:** While the B-HEX can easily expand an elastic pupil, the thin profile and flexibility does not allow it to tear the fibrotic rigid pupil. It is advisable to identify the rigid pupil at the outset (as below) and then use two Kuglen hooks to perform a limited bimanual stretch to render the pupil expandable for easy placement of the B-HEX.
2. **Re-use & Re-sterilization:** The B-HEX is sold as a single use disposable device. Re-use or Re-sterilization of B-HEX is not recommended as the shape and mechanical properties may change leading to reduced performance and intra operative breakage. That could lead to unanticipated and totally avoidable complications. Such complications may compromise the safety and visual outcome of the patient.

## B-HEX: Tips and tricks

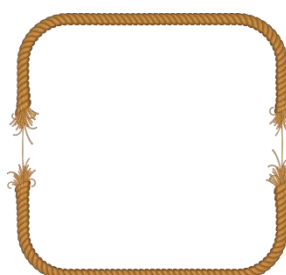
1. **View videos before first B-HEX use:** The simple design can be deceptive. Though there is practically no learning curve or requirement for hands on demonstration, it is absolutely essential that a few videos are viewed before the first use.
2. **Use only the genuine 'B-HEX 23 G Forceps' for insertion, tucking & removal:** The forceps is ergonomically designed such that the stalk is gently bent and the serrated jaws open in a plane perpendicular to the squeeze handle. Please look for the registered 'B-HEX' trademark to confirm genuineness.
3. **Keep the anterior chamber under-filled with viscoelastic; Iris bowing helps in tucking flanges:** Over-filling the anterior chamber pushes the iris against the lens capsule reducing the space required for tucking the flanges. A deep anterior chamber also makes the pupil margin less accessible for tucking of flanges.
4. **Inject Viscoelastic under pupil margin to lift it off from the anterior capsule:** This creates space to comfortably tuck the B-HEX flanges.



5. **Distinguish the Elastic Pupil from the Rigid Non-Elastic Pupil as soon as the paracentesis is made:** The IFIS pupil immediately snaps back to its original size following attempts at stretching it. This does not happen with nonelastic miotic pupils. This means, small pupils are of two types, elastic & non-elastic (rigid). The elasticity of the pupil should be tested as soon as the paracentesis is made. As the anterior chamber is inflated with BSS, the elastic pupil expands momentarily and returns to its small size. On the other hand, a rigid pupil hardly enlarges. An elastic pupil is expandable like a rubber band. Whereas, a nonelastic



**ELASTIC**  
Rubber Band  
**STRETCHABLE**



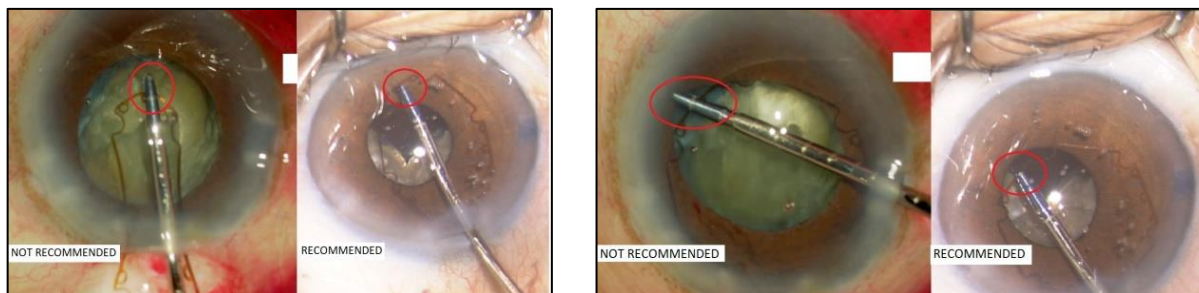
**NON-ELASTIC**  
String  
**TEARABLE**

rigid pupil is like a string and is not expandable but tearable. It will not expand until the pupil is stretched to tear the fibrous elements at the pupillary margin. It would be logical to assume that pupils undergoing intraoperative miosis are elastic in nature because they were reasonably dilated to start with.

- 6. Rigid and  $\leq 4$  mm Pupil; Stretch bimanually before using B-HEX. Preparation of the Non-Elastic Rigid Pupil for B-HEX:** The B-HEX can be engaged to an elastic pupil very easily because the margin stretches like a rubber band. **Because of its very thin profile, the B-HEX is not strong enough to tear the fibrotic band of a rigid pupil.** Since the rigid non-elastic fibrotic pupil is more like a string, it can be expanded only after stretching or tearing the fibrotic band at the margin with force. This can be achieved either with two Kuglen hooks or with the pupil expansion device itself. A pupil expander has to be bulky to be strong enough to stretch the pupil by itself. When stretched with the pupil expander itself, the tearing of the rigid pupil is asymmetric and uncontrolled. When the rigid pupil is stretched bimanually to 5 mm with two Kuglen hooks in all directions, the stretching or tearing of the sphincter is symmetric and controlled resulting in round pupils postoperatively. Alternatively, when the fibrotic membrane at the pupillary margin can be identified it may be carefully dissected and removed using microsurgical forceps. Both these techniques render the pupil expandable and facilitate the placement of any pupil expander device. If the pupil has been rendered expandable but is still very small requiring a longer excursion of the flange while tucking, a bimanual technique using a Kuglen hook may be used to facilitate tucking of the flanges.

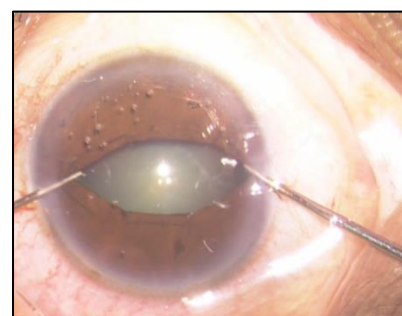
**If a Rigid pupil is not stretched** prior to the engagement of B-HEX, it is either difficult to tuck the third flange of the B-HEX or the B-HEX buckles. The management of both these situations is discussed below.

- 7. Place a drop of HPMC or any OVD into the housing:** Since the B-HEX is extremely springy in nature, a drop of HPMC into the housing and on the ring **before holding with the forceps**, makes handling easier and ensures a smooth travel.
- 8. Advance the B-HEX ring directly from the housing into the eye:** The housing is designed to carry the B-HEX ring to the incision in a sterile and 'deployment ready' state. After a drop of HPMC is placed on the visible leading flange of the ring, it is held with the B-HEX Forceps and advanced through the corneal incision into the anterior chamber in a single motion. No attempt should be made to remove the ring and hold it in the air or place it on the conjunctiva. These may result in the springy ring falling off and becoming unsterile.
- 9. Use the tips of the forceps jaws to hold the tabs of the Flanges:** The tabs of the flanges should be held with the tips of the jaws in a manner that no part of the jaw extends beyond the flange. Holding the central tab of the leading flange in this way during Insertion allows the B-HEX to be carried to the maximum extent into the AC in a single pass. Holding the tabs of the flanges in this way during tucking ensures that the tips of the jaws do not pass over the Iris as an attempt is being made to tuck the flange under it.



**10. Difficulty in tucking 3<sup>rd</sup> flange of B-HEX:** This happens when a rigid pupil has not been adequately stretched prior to engagement of the B-HEX. A safe remedy is to **bimanually stretch the unengaged part of the pupil with 2 Kuglen hooks**. Now the third flange can be tucked easily.

**11. Buckled B-HEX resulting in smaller than 5.5 mm expanded pupil:** This happens when the third flange of B-HEX is forcefully tucked in a rigid pupil which has not been stretched adequately prior to engagement. An **easy remedy** is to **gently bimanually stretch the 'Pupil - B-HEX complex' with 2 Kuglen hooks**. The stretching should be gentle and only to the extent permitted by the circumference of the B-HEX. Or else, the B-HEX may lose shape or break.



**12. While engaging/ tucking one flange, another previously engaged/ tucked flange gets disengaged:** This happens when the previously engaged flange was only partially tucked. It gets disengaged when the next flange is being drawn centrally for tucking. It may also happen if the B-HEX is used when in a pupil  $\geq 6$  mm to start with or when the pupil dilates during the surgery. An easy remedy is to stroke the pupil with a second instrument to make it smaller. This helps the notches of the B-HEX engage firmly with the pupil margin.

**13. Phaco Tip pushes a flange and the adjacent flange gets untucked:** Remove the Phaco tip and reengage the untucked flange using the B-HEX Forceps. Though it may be possible to 'get away' with only 2 tucked flanges, it is definitely not recommended.

**14. Is a 5.5 mm Pupil adequate for safe Phacoemulsification of hard cataracts?** The answer lies in asking ourselves, "Aren't we skilled enough to perform phacoemulsification through a 5.5 mm pupil with the assurance that it will not get any smaller?" With current machine fluidics, most surgeons are often tempted to take on a 5 mm pupil even without any pupil devices. Hence, an assurance that a 5.5 mm pupil will not get any smaller and the excellent video demonstrations on YouTube should instill enough confidence.

**15. Fixation of the globe with a side port instrument:** This prevents the eye from rotating out of the field during movements caused by the insertion and removal of the B-HEX Forceps.

16. **Prominent nasal bridge or deep set eye causing difficulty in accessing the paracentesis:** Rotating the eye in the direction opposite to the paracentesis either manually or by asking the patient to turn the eye, helps in gaining access.
17. **Two adjacent flanges inadvertently tucked under the iris:** Grasping the adjacent flange anterior to the iris with the B-HEX Forceps and drawing it centrally, helps untuck the hitherto tucked flange(s).
18. **Three or more flanges inadvertently tucked under the iris:** Immediately grasp any flange anterior to the iris with the B-HEX Forceps and bring the entire B-HEX ring anterior to the Iris. Now, restart tucking the flanges.
19. **Entire B-HEX ring slips under the iris:** It is possible to retrieve the ring. Injecting a little viscoelastic under the pupil margin will lift off the iris. Drawing the pupil margin towards one paracentesis with a Kuglen hook will allow visualization of a flange. The B-HEX forceps through the opposite paracentesis or main incision is used to grasp this flange and untuck it and anteriorize it. Then the rest of the ring can be brought anterior to the iris by the tire-ironing technique. Thereafter, tucking may be restarted.
20. **Attempt in the bag delivery of trailing haptic of IOL in a single pass:** Since the B-HEX ring is not holding or pinching the pupil margin, it is possible to dislodge it into the retro-iris space or capsular bag while manipulating the trailing haptic. Hence, it is preferable to place the trailing haptic into the capsular bag in a single pass without contacting the 'ring-pupil margin complex'.
21. **Trailing haptic not delivered in Bag:** Pushing the trailing haptic against 'ring-pupil margin complex' may dislodge B-HEX into the retro-iris space or capsular bag. The trailing haptic needs to be pushed in the IOL plane causing flexion of the opposite (leading) haptic-optic junction against the equator of the bag. This creates room for the trailing haptic to pass without contacting the 'B-HEX - pupil margin complex'. A big advantage of the B-HEX over other pupil expanders is that it is so thin and flush with the iris that it does not come in the way of the trailing haptic as it is dialed into the bag.
22. **B-HEX Ring dislodged into capsular bag or entangled with IOL:** Visualize the ring, hook it with a Kuglen hook and cut it and then draw it out of the eye using the B-HEX Forceps.
23. **IFIS & B-HEX:** Iris hooks or pupil expansion rings only serve to provide a constant pupil size for adequate visualization and safe phacoemulsification. Iris prolapse depends on the severity of IFIS. This in turn depends on the extent of thinning caused by Iris stromal and muscle atrophy. There is no credit to any device when we do not have iris prolapse. It is just lower grade of IFIS. The B-HEX with a low vertical profile allows a lot of room for instrument movement despite a floppy billowing iris. Since it can be removed through a 1 mm side-port incision, it can be invaluable in a tight situation with iris prolapsing from the main and side-port incisions.

- 24. Intraoperative Miosis after Capsulorhexis:** Injecting a little viscoelastic between the anterior capsular rim and Iris creates space for the flanges. As the flanges are tucked under the pupil margin and advanced towards the periphery, absence of resistance is an instant confirmation that the capsulorhexis has not been engaged. Looking through the microscope, the gaps in the 'scrolls' or 'pockets' of 'other pupil rings' are on the sides of the device and are not directly visible. Aligning these gaps to the pupillary margin is difficult. As the B-HEX is in a single plane, the gaps or notches that engage the pupil margin are directly visible from a top view.
- 25. B-HEX Removal: environment, technique & timing:** Since the B-HEX is very light and floats in BSS, it is safest to remove it in the presence of viscoelastic. The B-HEX Forceps is passed through the main incision to grasp the flange anterior to iris and closest to the incision. This flange is moved centrally to disengage the two notches at both its ends. Now, the ring can be just drawn out without attempting to disengage the other notches. As the ring is drawn out, the trailing notches disengage spontaneously and the other flanges are untucked as well. An alternative technique is to untuck all the flanges so that the ring is freely lying in the anterior chamber, which can then be drawn out.
- 26. B-HEX Removal under Irrigation:** The abovementioned techniques can be used with the Irrigation on too, but two aspects must be kept in mind: 1) Reduce the infusion to minimum so that there is no turbulence as the B-HEX is disengaged from the Iris. 2) A flange should be firmly grasped with forceps while the last flange is being disengaged without allowing it to be freely floating. Otherwise, once the ring is freely floating in the anterior chamber, it can spin and move around uncontrollably. Attempting to remove the ring under irrigation can lead to iris prolapse through the main incision, especially in IFIS.
- 27. Toric IOL & B-HEX Removal:** Removal of the B-HEX under Viscoelastic is always more controlled than under BSS because it is difficult to grasp the freely floating ring under continuous irrigation. Once the Viscoelastic has been removed from behind the IOL, the IOL is brought to the final alignment before removing the B-HEX. Then a very small amount of viscoelastic is injected in the anterior chamber. Now the removal of the ring with the B-HEX Forceps is very controlled. The residual viscoelastic in the anterior chamber can be washed out with only irrigation or may be removed with irrigation aspiration.
- 28. B-HEX in Vitreo-Retinal Surgery:** Infusion port is always the first step in combined Phaco-Vitrectomy. Insertion, tucking and removal of B-HEX are the same as in Cataract Surgery. Corneal entries are to be well hydrated at completion of phaco and prior to starting VR procedures. Proceed with VR surgery as per plan. Complete all VR procedures before removing the B-HEX. During removal of the B-HEX it is important to inject viscoelastic, reduce the infusion pressure to around 12 - 15 mm hg to prevent forward displacement of the lens iris diaphragm. Ensure the side-port used for removal is of not more than 1mm size to prevent AC collapse...remove with a B-HEX 23 G forceps only. Check IOP after removal of BHEX. If used, ensure adequate fill of Silicon oil / gas at completion.

#### 29. Care of B-HEX 23 G Forceps:

- a. The reusable B-HEX 23 G Forceps comes either with an autoclavable plastic truncated cone shaped cap or a metal cylindrical cap. The plastic cap is autoclavable.
- b. The narrow end of the plastic cap or the end with the collar like constriction on the metal cap is slid first over the forceps jaws and stalk. Reversing the cap will make it loose fitting and the forceps will slip through and get damaged.
- c. Cleaning: Damage due to residual viscoelastic which gets caked inside the tubular stalk is common. After use, the forceps is to be dipped in demineralized or distilled water for 15 minutes followed by repeated squeezing of the handle so that any residual viscoelastic is removed. It may be cleaned in an ultrasonic bath too. Dry the forceps well before sterilization.
- d. The titanium forceps is to be placed with the cap in the Sterilizing tray with silicon mat separate from other metal instruments. Ensure that there is no movement or rubbing against other instruments.

Visit: [www.medinventdevices.com](http://www.medinventdevices.com) Write to: [info@medinventdevices.com](mailto:info@medinventdevices.com)