

B-HEX[®] Pupil Expander - Pearls & Pitfalls

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The B-HEX[®] Pupil Expander (Med Invent Devices) is a disposable 6.5 mm flexible hexagonal device with notches at corners and flanges at sides. Alternate flanges with holes are tucked under the iris to engage the notches to the margin of the pupil to provide a 5.5 mm expanded pupil. Unlike devices with scrolls or pockets which require an injector to avoid snagging the incision, the preloaded B-HEX is inserted and removed through a 1.5 mm or larger incision using a B-HEX[®] 23 gauge micro-forceps. The thin profile and uniplanar design allow unhindered instrument movement during phacoemulsification, cortical cleaning and IOL implantation. The B-HEX is safely used even after capsulorhexis since the thin uniplanar notches are directly visualized to avoid the capsule margin. It is useful in standard coaxial phacoemulsification, MICS, FLACS, small pupil pars plana vitrectomy and shallow anterior chamber eyes.

While the innovative and patented design of the B-HEX offers many advantages, there are a few limitations. The following tips will help in safe and efficient usage of the B-HEX as well as other pupil expanders. Though the B-HEX is user friendly and requires average skills, this simple design is deceptive and has misled some surgeons to take the plunge without watching videos, resulting in unfavourable outcomes. Hence, it is strongly recommended that instruction videos are viewed at least before first use.

Keeping the anterior chamber (AC) under-filled with viscoelastic allows anterior bowing of the Iris and helps in tucking of flanges. Over-filling viscoelastic in the AC pushes iris against lens capsule making tucking difficult. A little viscoelastic injected under pupil margin to lift it off the anterior lens capsule further helps create space for flanges.

It is important to differentiate the 'Elastic' Intraoperative Floppy Iris Syndrome (IFIS) Pupil from the 'Rigid non-elastic' Pupil seen in pseudoexfoliation and uveitis. Pupil stretching is not effective in IFIS. The rigid pupil often has a fibrous ring with a fixed circumference and cannot be expanded like an elastic band. This needs to be stretched by causing micro-tears of the pupillary sphincter.² A simple technique to differentiate between a rigid and elastic pupil is to inject BSS and inflate the AC after making the side-ports.

The elastic pupil would stretch a little and enlarge in size while the rigid pupil would not budge. On the one hand, a bulky pupil expander will stretch the pupil but it is unwieldy and will also produce uncontrolled sphincter tears and on the other, the B-HEX is extremely thin and easy to handle but it does not have the mechanical strength to cause sphincter tears. With that trade-off, a pupil which is rigid and less than 4 mm, is better stretched bimanually to about 5 mm before placing Iris Hooks or a Pupil Expander. If stretching is not performed it is very difficult to tuck the 3rd flange. The remedy is to either stretch the pupil with a partially engaged B-HEX or use a bimanual technique to tuck this flange. While the flange is held with the 23 g forceps, a Kuglen hook introduced through an opposite side-port retracts the pupil margin to facilitate bimanual tucking. Though all 3 flanges are engaged, since this rigid pupil still has a fixed circumference it will cause the B-HEX to buckle. Even at this stage a bimanual stretch of the 'B-HEX-Pupillary margin complex' will result in an expanded 5.5 mm regular hexagonal pupil.



The recommended standard technique is to hold the leading flange with the B-HEX 23 gauge forceps³ and advance the B-HEX Pupil Expander into the AC till the entire device is in the AC and then place it on the Iris without any attempt to tuck the flanges. When the leading flange is held at the tips of the jaws of the forceps it is almost always possible to insert the entire device into the AC in a single pass. In smaller eyes, a part of the trailing flange may require to be tucked in in an additional step. The main and side-port incisions are to be used intelligently to access the flanges for tucking. By tucking the flange opposite the main incision first, the other two flanges to be tucked are very easily accessible using the side-port incisions. A flange may often be obscured by a dense Arcus Senilis or under incisions. A Kuglen hook can be used to nudge the partially engaged B-HEX to draw the obscured flange centrally and make it visible. If a large part or the entire B-HEX has inadvertently been placed behind the Iris, it is best

to retrieve the device and bring it entirely into the anterior chamber and restart the tucking process.

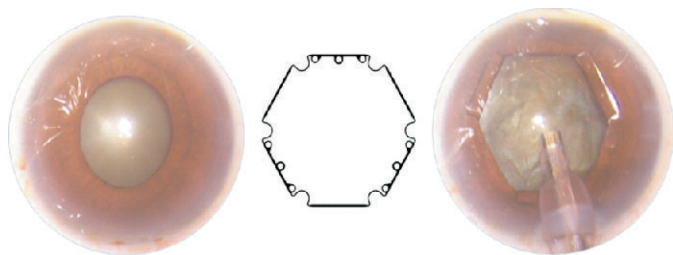


Figure 1: Alternate flanges of the B-HEX Pupil Expander tucked under the pupil margin to result in a hexagonal expanded pupil.

The B-HEX with its alternate flanges being anterior and posterior to the iris does dampen its billowing in an eye with IFIS. However, it must be realized that Iris hooks or pupil expanders do very little to prevent Iris prolapse in IFIS. Iris prolapse depends on various factors such as the extent of the IFIS pathology, AC depth, fluidics, incision construction, iris handling etc. What Iris hooks and Pupil expanders do is to provide an assured constant pupil size for uninterrupted visualization and safe phaco emulsification.

In a deep set eye, it is difficult to negotiate the side-port incision with the 23 g forceps to gain access to the flanges of the B-HEX. It is useful to rotate the eye to make the side-port easily visible and accessible. When manipulations lead to large excursions rotating the globe outside the operating field, it is helpful to fixate the globe and restrict its movement with a side port instrument.

The B-HEX is very safe for use even after the capsulorhexis. A little viscoelastic placed on the anterior capsular rim facilitates tucking of the flanges. The open notches are easily seen from the top view as the pupil margin is engaged. As a flange is tucked and carried a little distance to the periphery, if the capsulorhexis margin is visualized it is instant confirmation that the margin has not been engaged inadvertently.



Figure 2: If the capsulorhexis margin is visualized it is instant confirmation that it has not been engaged inadvertently.

It is important to realize that the engagement of a pupil expander to the pupil margin is not very firm and it is very easy to dislodge it inadvertently. Since attempting to deliver a large nuclear fragment from inside the bag to the anterior chamber could result in such dislodgement, it is advisable to chop these fragments to smaller pieces. Again, care must be taken not to push the pupil expander with the leading or trailing haptic of the IOL. An IOL placed on the Iris can often be pushed into the capsular bag by forcing it against the pupil margin. However, this would not be applicable in the presence of a pupil expander because any attempt to push the IOL against the pupil margin will result in pushing the pupil expander and dislodging it either into the capsular bag or behind the iris. An attempt must be made to deliver the leading and trailing haptic in the bag in a single motion. If the trailing haptic is not delivered into the bag, there should be no attempt to push it against the pupil margin as this might dislodge the B-HEX. A Kuglen hook may be used to push or pull the outer edge of the trailing haptic in the IOL plane to cause flexion of the opposite (leading) haptic at the haptic-optic junction against the equator of the bag. This creates room for the trailing haptic to negotiate without contacting the pupil margin. In the rare event that the B-HEX is dislodged into the capsular bag or is entangled with an IOL in the bag, it can be easily cut with a pair of scissors and drawn out.

If there is nucleus drop and there is a need to refer the patient to a vitreo-retinal facility for secondary management, it is advisable to leave the B-HEX temporarily engaged and the pupil expanded so as to facilitate further management. The B-HEX is made of Polyimide which is used in IOL haptics and is a biocompatible material.

References:

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4. Youtube Instruction Video: ‘Intraoperative Miosis in IFIS: B-HEX Safe & Easy Pupil Expander’ at <https://www.youtube.com/watch?v=Alfz6f2Q7Yk>