Comment on: ‘S’ means stop! Critical examination of capsular tension ring movements with Miyake-Apple video analysis

Page et al. described an excellent Miyake-Apple view that can alert surgeons to iatrogenic complication of capsular tension ring (CTR) insertion and identified cardinal movements of CTR implantation.1 In the Miyake-Apple view, all CTRs displayed cardinal movements within the injector, initially adjacent to the side of the inner diameter of the CTR, and as the CTR made contact with the capsule, it shifted first to the center and then to the opposite side of the injector lumen.1

The authors have emphasized that 2 main sources of iatrogenic zonular damage during CTR implantation are entanglement and entrapment and have suggested that folds in the capsular bag are an early indicator of entrapment or entanglement, whereas the movement of the capsular bag is a late indicator of significant stress on the zonular fibers.1,2 In addition to this, we suggest 1 important technical tip to decrease entanglement when the CTR makes contact with the capsule.

On encountering signs of excessive zonular stress such as folds in the capsular bag and/or capsular movement, the CTR shifts from the inner side of the injector lumen toward the outer side of the injector lumen (Figure 1, A). At the first sign of this movement, we can change the direction of the injector lying parallel to the edge of dilated pupil and slightly withdraw the injector through the corneal incision while simultaneously still pushing the plunger, then the CTR can move adjacent to the side of the inner diameter of the CTR instead of the opposite side of the injector lumen, reducing the capsular stretch (Figure 1, B). This agile movement to keep the CTR adjacent to the side of the inner diameter of the lumen should be applied throughout the whole implantation until the trailing eyelet can be safely located in the capsular bag. By monitoring the cardinal movement of the CTR inside of the lumen of the injector, this movement can prevent and decrease the entanglement, ensuring successful CTR deployment with less capsular damage.

Because the iris obscures the surgeon’s view of the course of the CTR during insertion, surgeons can only estimate this cardinal movement of the CTR behind the iris from the movement inside the injector such as inner or outer diameter of the injector. Keeping the CTR pathway aligned with the inner diameter of the CTR injector lumen is a simple and safe technical tip to deploying it, which can be performed without using a second instrument in the side-port incision to push off the trailing and leading end of the CTR.3

We recommend this agile movement during the insertion of the CTR while estimating cardinal movement in the capsular bag from the visible movement in the injector lumen to reduce iatrogenic capsular stress.

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Reply: ‘S’ means stop! Critical examination of capsular tension ring movements with Miyake-Apple video analysis. We thank Cho et al. for their interest in our article. Our research demonstrated that a capsular tension ring (CTR) will make predictable, cardinal movements during implantation. These observations were first made in surgery, then tested with Miyake-Apple video analysis. To summarize our findings, as the CTR exits the injector, the body of the CTR will be adjacent to the side of the injector lumen on the inner diameter of the ring while deployed. As the CTR makes contact with the capsular bag, it shifts across the lumen to the opposite side until fully deployed. These movements predictably occur with atraumatic implantations. Deviation from these movements may be an early indicator of a traumatic insertion.

Cho et al. have suggested a maneuver that has been described in the literature; however, it is a good point and worth repeating.1,2 After the capsular bag is filled with an ophthalmic vicosurgical device, the CTR should make contact with the capsule at the lowest angle of incidence possible to minimize stress on the zonular fibers. For a clockwise insertion, the surgeon should direct the angle of the injector to the left within the incision. This maneuver

Figure 1. CTR movement according to the injector direction. A: CTR stretches the capsular bag (black arrow) with the movement adjacent to the side of the injector lumen (white arrow). B: CTR deployment occurs with less stress to the capsular bag, with the movement adjacent to the inner side of the injector lumen (white arrow). CTR = capsular tension ring
will create a lower angle of incidence for the CTR as it approaches the fornix of the capsular bag, thus minimizing stress on the zonular fibers.

To address the suggestion that at the first signs of “excessive zonular stress” to withdraw the injector slightly and angle it to “keep the CTR on adjacent to the side of the inner diameter of the lumen” throughout the implantation, we cannot confirm. Our surgical observations and experiments found that when the CTR is in contact with the capsular bag after a significant length of the CTR body is in contact with the capsular bag during deployment, it will shift to the opposite side of the lumen despite the angle of attack. However, this was not a specific objective of our research, and we did not isolate angle of attack as a variable for potential influence on the cardinal movements.

Caution should be used regarding the suggestion to withdraw the injector from the eye in a case of suspected CTR entanglement. If the CTR is truly entangled, withdrawing the injector could damage the zonular fibers. If entanglement has occurred, one might consider first reversing the CTR back toward the injector to detangle it and add more ophthalmic viscosurgical devices before withdrawing the injector. In general, it is preferred to have as little of the injector tip in the eye as necessary for CTR deployment.

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Comment on: Efficacy of toric intraocular lens and prevention of axis misalignment by optic capture in pediatric cataract surgery
We read with interest the study published by Tachibana et al. They showed how a toric intraocular lens (IOL) can be prevented from decentration in children. We congratulate the authors for their technical skills as it is not an easy procedure to perform. In their introduction, they mention that they have been performing optic capture, but their related studies are not cited and listed in the references. It would be helpful to know their experience. Do they adjust IOL power for placement behind the bag? Does vaulting and progressive fibrosis of the bag change the astigmatism, especially in younger children? In the meta-analysis which they quote, there is no mention of the IOL used. This is a very important parameter to measure the success of posterior optic capture in children. Our randomized study has shown excellent results with a 3-piece Hoya IOL over a period of 2 years. In the largest series by Vasavada et al., a 3-piece IOL was used. A video supplement would have been informative with the published article, as the authors have used a 1-piece IOL for performing optic capture. These IOLs have thick haptics as does the optic–haptic junction, which is the most important factor in locking the IOL and getting a well-sealed bag to prevent visual axis obscuration (VAO). A 1-piece IOL also does not have a rigid structure and memory like a 3-piece IOL and so is not a good option for posterior optic capture. There is a high chance of slippage into the vitreous with a 1-piece IOL and also more VAO. With a large posterior capsular opening, the risk of losing the 1-piece IOL into the vitreous is high as the IOL stability rests solely on the optic as the haptics do not open at the exit from the cartridge. As well, the IOL rotation that must be performed before haptic opening with a toric IOL increases the risk of the IOL going through a larger than usual posterior capsular opening. A photograph showing the optic–haptic junction would have been helpful. The authors should have mentioned the difficulties and complications encountered during this procedure, as with increasing age, the capsule becomes less elastic, and the chances of a tear increase during a capture. The size of the posterior rhexis is an important factor for a capture. Did the authors find any difference in final astigmatism related to this? Sometimes, posterior rhexis size becomes too large for a successful capture. In such cases, it would be impossible even to implant an IOL in the bag, which is of more concern with the 1-piece toric IOL. Until more large, randomized studies with a 1-piece IOL are available, this technique for a toric IOL that is only available on a 1-piece platform should be reserved. It would be worthwhile mentioning how they would explant this IOL or maneuver the IOL to a new axis later if required as they have implanted it in a 3-year-old child in whom astigmatism can change.

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