

## Modified CTR Delivery System

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### Abstract

**Purpose:** Design and Use of new CTR injector system. **Materials and Method:** A CTR injector was designed from a 14G, 16G and 18G IV catheter. The eye of CTR was threaded with suture 10-0 Nylon. CTR was injected into the bag through the main phaco port in a folded manner through 2.2 and 2.8 mm incisions. The sutures were removed only after completion of surgery. **Result:** The CTR insertion was smooth. Threading allowed slow and guided release of CTR in the bag and safe recovery if CTR removal was required in case of PCR. No other intra-operative also complications were noted. **Conclusion:** New CTR delivery system is easy to make and use; is reproducible and safe to use. It allows safe and easy removal per-operatively, if need be.

**Keywords:** Subluxated Cataract, Capsular Tension Ring( CTR), Phacoemulsification.

Capsular tension rings (CTR) are one of the most important accessories in the armament of cataract surgeons to combat subluxated or compromised integrity of the capsular bag. Almost all cataract surgeons have used the ring at some point or the other and it has saved many from sleepless nights.

CTR can be inserted in the eye either manually or with the help of either disposable or metallic injectors. One of the problems faced during either manual insertion or with the help of current injectors is that the trailing end sometimes get lost in the sulcus and further complicates a difficult situation. Another important point is that, when we inject the CTR by the common current methods, it puts a lot of stress on the remaining zonules and may further weaken or damage them. Some have advocated threading one eye of the CTR segment for easy retrieval if it dislocated posteriorly. We needed a design which could overcome these problems, but the delivery system was not only easy and fast to make, but also cheap. Hence, we designed this new CTR injection system.

#### Purpose :

To evaluate a new CTR delivery system

#### Materials and method:

Conventional CTR was used. Initially, a 10-0 Nylon suture with straight needle and 16G or 18G IV Catheter

was used to make the delivery system. The needle of the cannula was passed from the opposite end of the cannula, through the whole length and brought out from the other side. Then both the eyes of the CTR was threaded and again the suture needle was threaded into the silhouette IV needle and passed from the tip of the IV cannula and brought out from the other end. Now we have a CTR with both eyes threaded and the both the ends of the suture passed through the IV cannula with free ends coming out from the hub end of the cannula. Now gently both ends of the sutures are pulled uniformly and the CTR is pulled into the cannula tip till only about 1-2mm of folded CTR remains outside the tip. Care must be taken not to pull the CTR in very fast or too much or the folded loop of the CTR might snap and break. The needle was then inserted in the conventional manner into the cannula till it lightly pushed the CTR. Now the foldable CTR delivery system was ready for use. The CTR was injected similar to injecting a foldable lens, into the bag. The sutures remained threaded and were secured to one side of the main phaco wound. After completion of surgery, a spatula was inserted through the side port. Both the sutures were slightly pulled away from the capsular margins with the spatula, one end was cut outside the wound and the other end was pulled gently to remove the sutures from the CTR without damaging the bag or

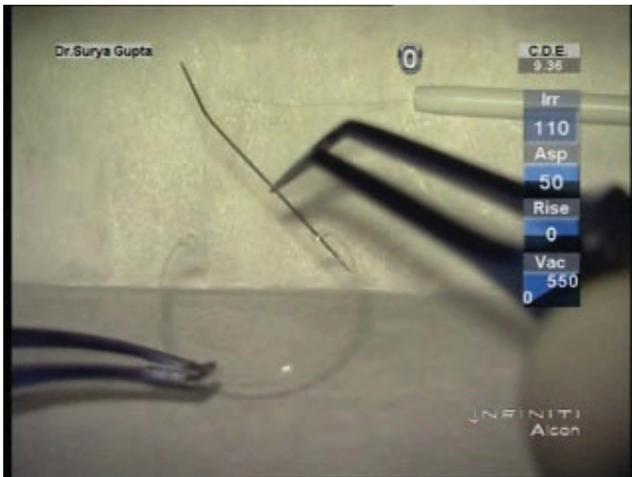
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Threading of the “eyelets” of the CTR with 10-0 Nylon Sutures



Pulling the CTR inside the IV catheter in a “folded” manner for “Injectable” insertion in the bag.



“Injection” of the CTR inside the Bag.

dislocating the CTR. This method was used in first three cases.

In the fourth case, one end of the suture was lost in the canula before the CTR was injected and could not



Exit of the Sutures from the side of the IV catheter, about 1 cm from the tip of the catheter.



Removal of the sutures after completion of the surgery. The sutures are supported away from the margins of the anterior capsule to avoid injury, by a spatula.

be retrieved. Here, both the ends of the suture was taken out from the cannula tip while the CTR was still threaded. The suture ends were secured with a knot a little distally. A 26G needle was taken and the IV cannula was punctured about 1cm from the tip with the 26G needle. The tip of the 26G needle was taken out from the cannula tip. The needle of the suture was fed into the 26G needle and both ends of the suture was taken out from the side of the canula in a rail-road fashion. Then, the sutures were gently pulled to fold the CTR into the cannula tip as before and the rest of the surgical steps were repeated as previously mentioned. In subsequent cases, this technique was used as it was faster and convenient.

**Result :**

CTR injection and delivery was smooth and in the bag. No complications were noted during surgery. In no case, the CTR was required to be removed. In no case was there any need to convert to peri-bulbar

block when the case was started under topical anaesthesia. No patient complained of any extra discomfort during insertion of the ring. No difficulty was noted during phacoemulsification or during insertion of the lens, with the sutures in situ.

### **Conclusion :**

The modified CTR delivery system was easy to use. The materials are freely available and the delivery system is easy to make. It can be pre-prepared before surgery or during surgery. It can be used through conventional phaco ports and instruments.

### **Discussion:**

CTR have come to the rescue to many surgeons in difficult situations to stabilize the capsular bag but they are not free from complications.<sup>1,2,3</sup> CTR being lost in the sulcus during insertions, can be very difficult and traumatic to retrieve. Dislocation of CTR during insertion or during surgery after inadvertent posterior capsular rent can be nightmare. Stress on the remaining zonules during insertion in a bag with compromised stability is also something to worry about with current delivery methods.<sup>1</sup>

This new CTR delivery system tries to overcome most of these complications. The insertion in a folded manner in the bag ensures equal stress in all quadrants of the bag without undue stress in any one segment. This helps in reducing stress in the remaining segments or in areas with weak zonules. Since both the eyes of the CTR are threaded, if need be, the CTR can be removed in a foldable manner by simply pulling the

stay sutures and pulling the CTR back into the IV cannula. The stay sutures also ensure that the ends of the CTR are always accessible when dislodged out of the bag or in case of posterior capsular rent, when they need to be removed. The materials used in this new delivery system are freely available and the system is easy and fast to make. Either they can be prepared beforehand in cases of planned implantation or they can be prepared per-operatively if bag stability is noted to be compromised. We recommend this delivery system to be used in all cases where CTR implantation is indicated or needed.

This new delivery system is easy to use and requires minimal learning curve for surgeons who are already using foldable lens. Its beauty lies in its simplistic design and the rapidness with which it can be made, when needed. With further design modification and refinement, we hope to improve this further and make phacoemulsification in subluxated cataracts more comfortable.

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