TECHNIQUE

Twenty-five-gauge trocar anterior chamber maintainer: New device for infusion

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The technique, feasibility, and results of a new 25-gauge trocar–anterior chamber maintainer (ACM) designed for maintaining intraoperative fluid infusion is described in this prospective interventional analysis. The 25-gauge trocar–ACM with an overall length of the trocar blade of 6.0 mm, cannula length of 4.0 mm, and the cannula tip beveled at 45 degrees to the base was designed and used in all the cases. The dimensions of the sclerotomy wound that comprised of the internal ostium, external ostium, wound length, and the time interval for wound apposition in the postoperative period was analyzed by spectral-domain anterior segment optical coherence tomography.

J Cataract Refract Surg 2018; ■:■–■

Online Video

Trocar cannulas are the mainstay of sutureless scleral wound creation in microincision vitrectomy surgery. We describe a new device, a 25-gauge trocar–anterior chamber maintainer (ACM), designed for fluid infusion into the anterior chamber. We previously described the technique of use of a conventional trocar cannula as an ACM for fluid infusion.[1] However, we believed a new device should be designed specifically as an ACM because of the problems encountered using conventional 23- or 25-gauge trocars for this purpose. Specifically, the shaft of the trocar blade was too long and the surgeon had to take extra care while introducing it into the eye to prevent the blade from hitting the corneal endothelium. Hence, to overcome the shortcomings, a new trocar–ACM was designed. With the first prototype of the new 25-gauge trocar–ACM, spontaneous extrusion of the device occurred intraoperatively. Further design modifications were made. The final product was a trocar–ACM that is a combination of a trocar cannula system and an ACM.

Figure 1 shows some dimensions of the new trocar–ACM. The trocar blade is stainless steel and is beveled; the outer diameter of the trocar is 0.51 mm. The cutting edge of the trocar blade is 2.00 mm, and the blade has a slimmer profile, with tapering at the top and bottom. These design modifications were made to reduce the resistance to blade insertion and to help achieve good wound architecture. The trocar blade is solid rather than hollow to make insertion easier. The polyimide steel cannula is beveled with a 45-degree angulation at the base of the shaft. The angulation ensures that the cannula fits properly into the anterior chamber, with the beveled slope placed along the corneal endothelial surface (Figure 2, *A*). The cannula's inner diameter is 0.54 mm and the outer diameter, 0.64 mm. The gap between the trocar and the cannula is minimal to reduce potential tissue friction. The edge of the cannula tip is beveled so that it easily glides through tissue during insertion. The shaft of the cannula is covered with aluminum dusting to facilitate its adherence to the scleral wall, preventing spontaneous extrusion. Figure 2 shows additional dimensions of the new device.

SURGICAL TECHNIQUE

Surgeries are performed using peribulbar anesthesia, in this case 4 mL lidocaine hydrochloride (Xylocaine 2.0%) and 2 mL bupivacaine hydrochloride 0.5% (Sensorcaine) under monitored care. After conjunctival displacement, the trocar is introduced 0.5 mm from the limbus, creating an oblique linear incision; the trocar enters the anterior chamber in front of the iris tissue (Figure 3, *A* to *C*). The cannula is placed flush to the surface of the sclera, and the trocar is withdrawn (Figure 3, *D*). The infusion line is then attached

Submitted: January 26, 2018 | Final revision submitted: March 22, 2018 | Accepted: March 22, 2018

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0886-3350/$ - see frontmatter
https://doi.org/10.1016/j.jcrs.2018.03.021

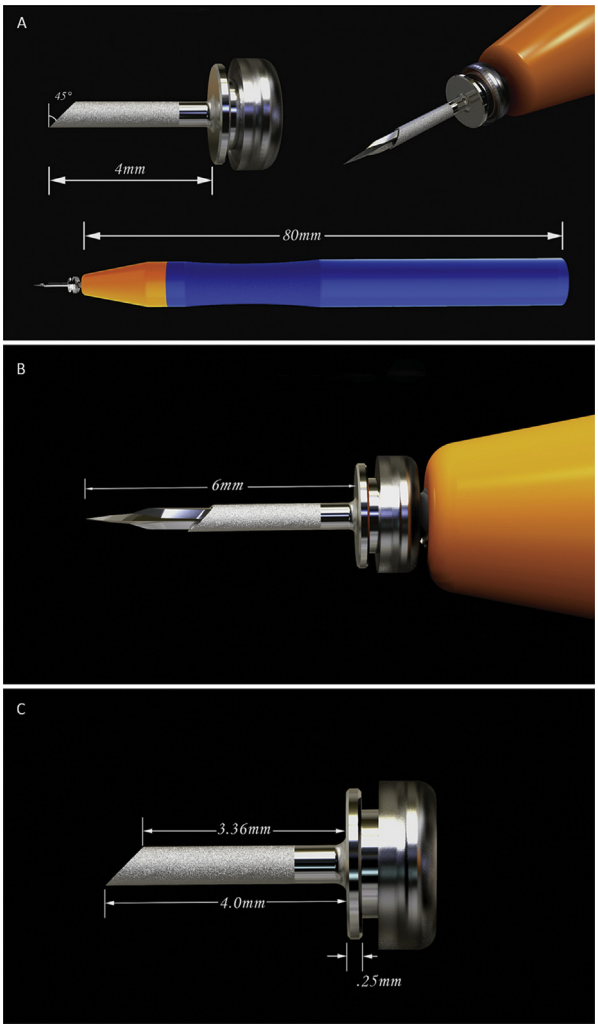

Figure 1. The trocar–anterior chamber maintainer. *A*: Cannula, bevel, and handle. *B*: Trocar blade. *C*: Cannula bevel.

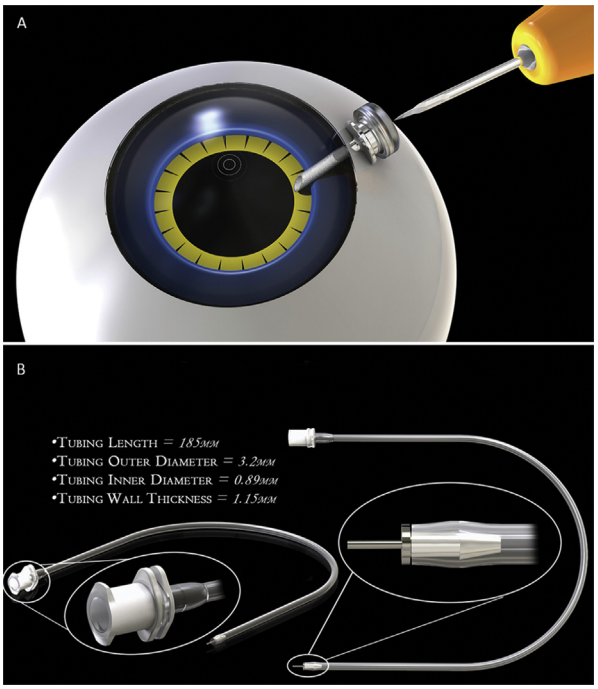

Figure 2. *A*: The trocar is being withdrawn and the cannula placed so that it is in front of the iris tissue. *B*: Dimensions of the tubing.

to the hub of the cannula (Figure 3, *E*). At the completion of the surgery, infusion is stopped and the hub of the cannula is removed in the same axis at which it was introduced (Figure 3, *F*) (Video 1, available at http://jcrsjournal.org).

Results

Nine eyes of 9 patients had surgery during which the trocar–ACM was used. The procedures adhered to the tenets of the Declaration of Helsinki, and the local ethical committee approved the protocol. All patients provided informed consent before surgery. Table 1 shows the patients' demographics.

Postoperatively, the sclerotomy incisions were examined at the slitlamp and by spectral-domain anterior segment optical coherence tomography (AS-OCT) (IVue, Optovue, Inc.) at 1 day, 7 days, 2 weeks, and 1 month. The examinations were performed to determine whether the incision was leaking and whether there was sclerotomy suture closure. The internal ostium size on the endothelial side and external ostium on the limbal side was measured by cross-sectional corneal scans across the trocar–ACM entry site. Longitudinal sections were taken for measuring the tunnel length (μm), with the axis of the corneal scan directed along the wound. Central corneal thickness (CCT) and the presence of Descemet membrane detachment at the trocar–ACM entry site were documented.

The data were entered in Excel software (Microsoft Corp.) and analyzed using SPSS software (version 16.1, SPSS, Inc.). Continuous variables were expressed as the mean ± SD, and categorical variables were expressed as individual counts. The nonparametric test was used for evaluation, and a P value less than 0.05 was considered statistically significant.

Table 2 shows the wound parameters in each case. Postoperatively, the mean diameter of the internal ostium on AS-OCT was 47.2 ± 32.4 μm at 1 day and 5.0 ± 10.0 μm at 7 days (P = .01, Wilcoxon signed-rank test). The mean diameter of the external ostium was 29.56 ± 32.06 μm and 8.89 ± 12.08 μm, respectively (P = .03, Wilcoxon signed-rank test). The mean width of the visible tunnel at the corneal end was 36.00 ± 32.47 μm (P = .02, Wilcoxon signed-rank test), and the mean length of the tunnel was 508.0 ± 159.9 μm. There was a statistically significant reduction in the mean CCT 1 day and 7 days postoperatively (698.89 ± 127.44 and 571.89 ± 28.50, respectively) (P = .01, paired t test). At 2 weeks, all the wounds were completely sealed and could not be detected on AS-OCT examination (Figure 4). There were no cases of wound leak or Descemet membrane detachment.