



A Simple Method for Detecting Vitrectomy Infusion Line Position in Hazy Media, in Case of Poor Visualization

Purpose: To introduce a simple and practical method for detecting vitrectomy infusion line position in a hazy media.

Methods: The position of the infusion cannula was evaluated before and during vitrectomy in 17 eyes of 17 patients with hazy media. This procedure was performed by using the light pipe inserted partially into the cannula and determining the color of transmitted light into the vitreous cavity. Dark red or brownish color was considered as suprachoroidal placement and bright whitish color as the correct position of the cannula tip.

Results: In 13 patients, the position of the cannula was considered as a precise position by using the aforementioned method at the beginning of the operation, and vitrectomy was performed without any infusion line-related complications. In two cases, the incorrect placement of the infusion cannula was confirmed with this technique, and the cannula was reinserted and repositioned. In two cases, secondary slippage of the cannula in suprachoroidal space was detected by using this method during vitrectomy, and another cannula was tried in another position.

Conclusion: Using the color of light pipe inserted partially into the cannula is a safe and simple method for evaluating the position of the infusion line in the eye.

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Intraoperative choroidal detachment is a rare but potentially devastating occurrence during vitrectomy surgery. One of the most common causes of intraoperative choroidal detachment during vitrectomy is initial placement of the infusion cannula into the choroid or suprachoroidal space. This occurs due to misinterpretation of the correct position of the cannula tip because of the poor visualization.¹ The second common cause is partial retraction of the infusion cannula into the choroid or suprachoroidal space during vitrectomy despite the initial correct placement.^{2–4}

The routine method for detecting the correct initial placement of the infusion cannula is a direct visual-

ization with transcorneal illumination using an external light source before turning on the infusion. In cases of hazy media (e.g., severe corneal opacity, endophthalmitis, dense vitreous hemorrhage, or significant cataract) detecting the correct position of the cannula can be very challenging and time consuming, especially in cases of presumed choroidal detachment or hypotonia.

This study aims to introduce a simple and practical method to distinguish suprachoroidal versus intravitreal positioning of the cannula tip using the color of illuminated light through the cannula.

Methods

Over a 12-month period, 17 eyes of 17 patients underwent 23-gauge vitrectomy procedures (15 eyes because of the hazy media and 2 eyes due to the secondary slippage during vitrectomy). Of the 15 eyes with hazy media, 4 patients had a history of repaired penetrating ocular trauma, severely distorted cornea and dense vitreous hemorrhage. Eight patients had

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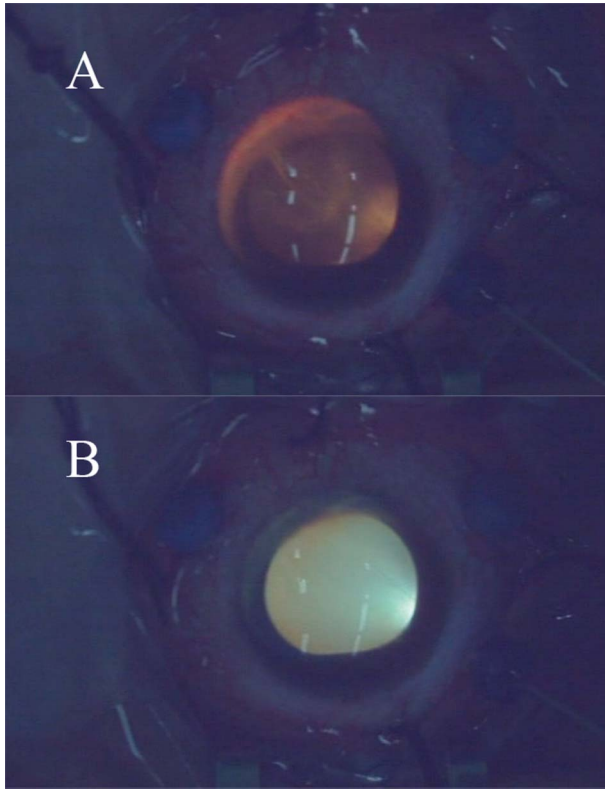


Fig. 1. Reinserting the cannula in the same place. **A.** Dark-brown light color indicates the incorrect placement of cannula tip in the suprachoroidal space. **B.** White reflex shows the correct placement of the cannula after reinserting in the same place.

a history of fulminant postoperative endophthalmitis with corneal involvement; and three other patients were suffering from traumatic cortical cataract and vitreous organization. Two eyes with secondary slippage were diabetic patients with advanced proliferative diabetic retinopathy.

In cases with hazy media, 23-gauge cannula was inserted using a beveled technique. The DORC Xenon BrightStar Illumination System (Kingston, NH) with a 435-nm cutoff filter was used as the light source. When the correct placement of the cannula tip could not be confirmed by the direct visualization and external illumination through the cornea, a 23-gauge light pipe was partially inserted through the cannula. Afterward, operating microscope was turned off, and the color of the transmitted light through the cannula into the vitreous cavity was observed through the cornea. In case of suprachoroidal placement of the cannula tip, the light intensity was decreased, and the light was dark red or brownish. If the cannula tip was in the vitreous cavity, the light was bright and had a whitish color (see **Video, Supplemental Digital Contents 1 and 2**, <http://links.lww.com/IAE/A295> and <http://links.lww.com/IAE/A296>), which demon-

strates different colors of light. In two cases, the incorrect placement of the infusion cannula was confirmed with this technique; therefore, the cannula was removed and reinserted in another place. In the remaining 13 patients for whom correct placement of the infusion cannula was confirmed by the bright and white transmitted light, the infusion line was connected to the cannula and turned on. The surgical procedure was then performed without any complications.

In two patients, initial placement of the cannula tip was confirmed by the direct visualization through the cornea, and vitrectomy was started uneventfully. An enlarging choroidal detachment in the inferotemporal quadrant was noted during the vitrectomy procedure. The infusion line was disconnected immediately from the inferotemporal cannula, but the cannula remained in place. We could not distinguish the primary suprachoroidal hemorrhage/effusion from the secondary retraction of the infusion cannula into the choroid or suprachoroidal space. Light pipe was partially inserted in the corresponding cannula, and the transmitted color of light was noted. Dark-brown color of light was an indicator of suprachoroidal slippage of the cannula tip. Cannula remained in place for drainage of the suprachoroidal fluid, and another cannula was tried in another position.

Discussion

With the advent of 23- and 25-gauge pars planavitrectomy, it has been postulated that the risk of intraoperative choroidal detachment may increase compared with that of 20-gauge vitrectomy.³ Whereas the infusion port is sutured in place in 20-gauge vitrectomy, 23- and 25-gauge vitrectomy systems use self-fixating, unsutured cannulas, which may be more likely to protrude into suprachoroidal space from the beginning or retract and subsequently infuse into the choroid or suprachoroidal space during vitrectomy.¹⁻³ The risk increases when the media is hazy; hence, there is no clear view of the fundus and vitreous cavity. When the proper placement of the cannula tip cannot be documented, some ordinary methods for detection with variable success rates may be proposed. Application of the secondary long inflow, which is visible behind the crystalline lens, retaining small air bubble in the tip of infusion line and tracing bubble in vitreous after opening the infusion line, anterior chamber maintainer in aphakic patients, and estimating the flow rate of infusion through the drip chamber of infusion set are among these methods. None of the aforementioned techniques are reliable and useful in hazy media or in choroidal detachment.

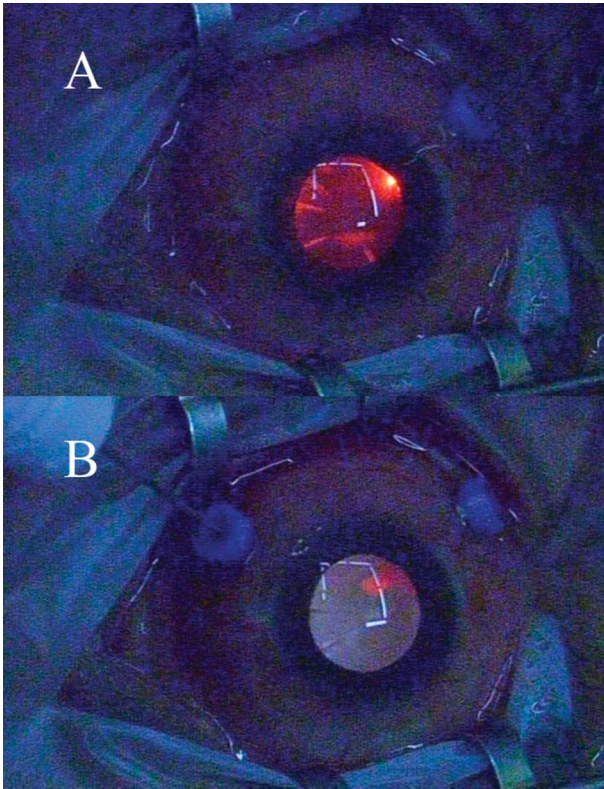


Fig. 2. Changing the place of cannula after detecting the incorrect placement by the aid of the light pipe color. **A.** Red-brown color indicates that the placement of cannula tip is in the suprachoroidal space. **B.** Note the natural color of the reflected light pipe after changing the place of cannula.

This study represented a simple and effective method for ensuring the intravitreal placement of the cannula tip in 23- and 25-gauge vitrectomy by using the color of light, which is illuminated through the cannula. Using this method on our patients resulted in no cannula-related complication. Passing white light through the brown layer of the choroid results in a reddish brown light observed in the vitreous cavity. In contrast, the light passing directly into the vitreous cavity even in hazy media results in a whitish hue. Being

familiar with the red-brown hue can lead to proper diagnosis of suprachoroidal placement of the cannula tip (Figures 1 and 2).

It is noteworthy to remember that distinguishing between red-brown color due to suprachoroidal placement of cannula and the normal changes in light color due to haziness of media needs experience. The surgeon's appreciation can be augmented by using this method on different patients and different situations. When the surgeon is able to recognize the normal transmitted light color, any change in transmitted hue should be regarded as abnormal which necessitates rechecking the cannula position. In doubtful cases, comparing the transmitted light through different cannulas that are inserted in other quadrants can be helpful.

The limitations of this method include variable reliability related to the experience of surgeon. However, it can be regarded as a complementary or assistive method by providing additional information about cannula placement.

Key words: inflow, suprachoroidal effusion, infusion line, light color, suprachoroidal placement of cannula.

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