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Intracameral dynamic spotlight-assisted cataract surgery in eyes with corneal opacity, small pupil or advanced cataract

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A 62-year-old female patient with corneal opacity underwent cataract surgery. The microscope light aggravated corneal scattering and reflection, and the light passing through cornea was attenuated (Fig. 1A). A conventional 23-gauge illuminator was inserted into the anterior chamber through a 0.7 mm paracentesis wound, and the microscope light was extinguished to more highlight the dynamic intracameral illumination. Because the illuminator was inserted into anterior chamber, corneal scattering and reflection were attenuated and much better view was provided to the surgeon. Furthermore, because the surgeon held and adjusted the illuminator, the intracameral spotlight illumination was dynamic, focused and stereoscopic. During capsulorhexis, phacoemulsification and anterior and posterior capsule polishing, the intracameral illumination provided a real-time, three-dimensional high-quality images (Fig. 1C,E,F).

Second case was a 58-year-old female patient with small pupil and angle-closure glaucoma who underwent cataract surgery. At the beginning of the surgery, the pupil was widened to 5.0 mm following synechiolysis and injection of ophthalmic viscosurgical device. The small pupil compromised retroilluminated retina reflex, and the field of microscope illumination was just inside of the small pupil (Fig. 2A). After an intracameral illuminator

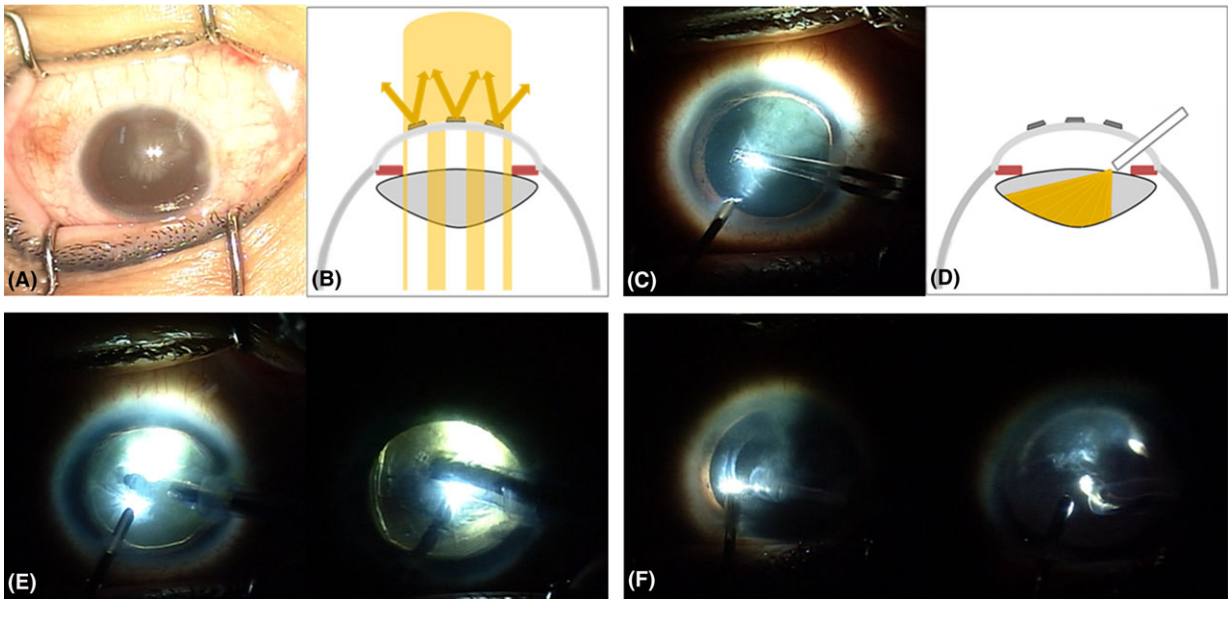

Fig. 1. A 62-year-old female patient with corneal opacity. (A) The operating microscope view. (B) A schematic diagram of operating microscope illumination in an eye with corneal opacity. (C) Capsulorhexis using the intracameral illuminator. (D) A schematic diagram of intracameral spotlight illumination in an eye with corneal opacity. (E) Nucleus sculpting (left) and nucleus fracture (right) using the intracameral illuminator. (F) Anterior (left) and posterior (right) capsule polishing using the intracameral illuminator.

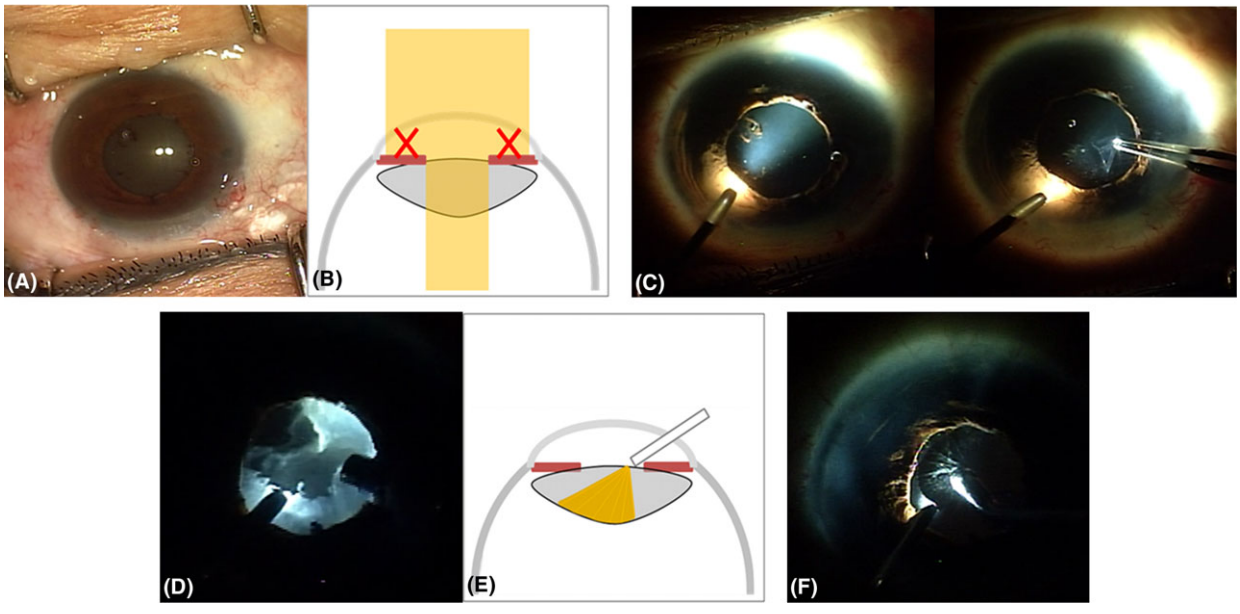

Fig. 2. A 58-year-old female patient with small pupil and angle-closure glaucoma. (A) The operating microscope view. (B) A schematic diagram of operating microscope illumination in an eye with small pupil. (C) The visualization of anterior capsule with the intracameral spotlight (left), and capsulorhexis using the intracameral illuminator (right). (D) Phacoemulsification using the intracameral illuminator. (E) A schematic diagram of intracameral spotlight illumination in an eye with small pupil. (F) Posterior capsule polishing using the intracameral illuminator.

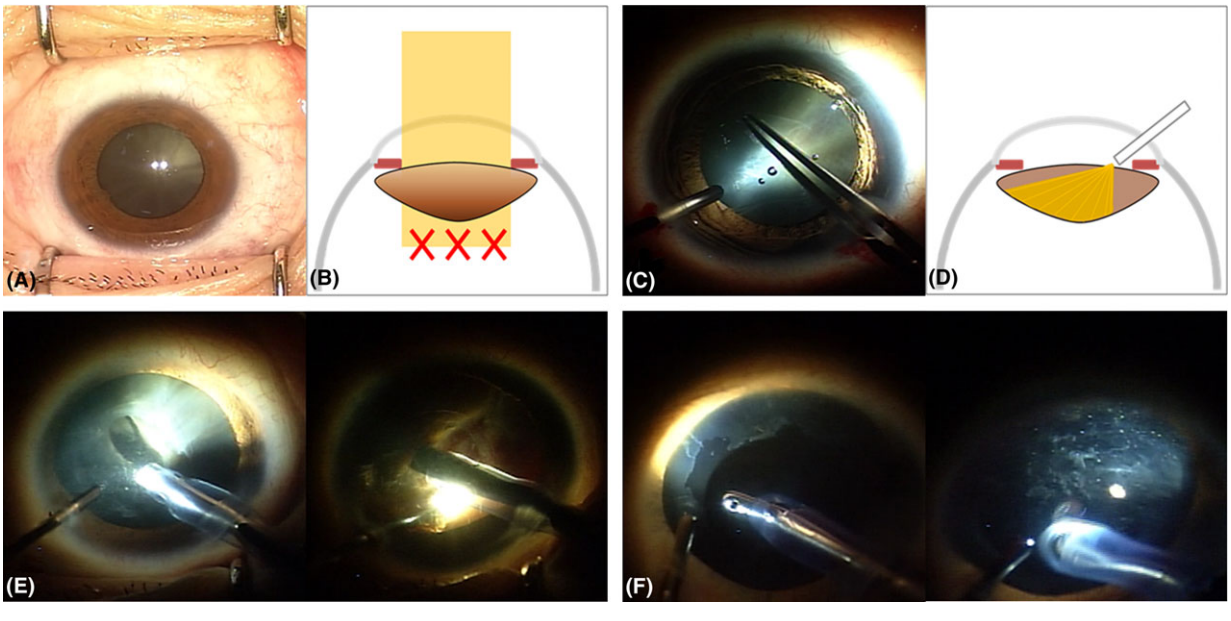

Fig. 3. A 46-year-old male patient with vitrectomized brunescent cataract. (A) The operating microscope view. (B) A schematic diagram of operating microscope illumination in an eye with advanced cataract. (C) Capsulorhexis using the intracameral illuminator. (D) A schematic diagram of intracameral spotlight illumination in an eye with advanced cataract. (E) Nucleus sculpting (left) and nucleus fracture (right) using the intracameral illuminator. (F) Anterior (left) and posterior (right) capsule polishing using the intracameral illuminator.

inserted, the visualization of anterior capsule was much improved during capsulorhexis (Fig. 2C). During phacoemulsification and posterior capsule polishing, visualization of the lens structures was much improved. Furthermore, as the intracameral spotlight swivelled within the anterior chamber, additional surgical field under the inferior iris was created, because the angle of illumination was oblique and the light from the intracameral illuminator could reach at the area under the small pupil (Fig. 2D,F).

Third case was a 46-year-old male patient with vitrectomized brunescent cataract. Under the operating microscope, the visualization of anterior capsule was very poor, because the severe lens opacity compromised retroilluminated retina reflex (Fig. 3A). The visualization of the lens structures was much improved with the intracameral spotlight during capsulorhexis and phacoemulsification. While the operating microscope generated poor retroilluminated retina reflex, the intracameral spotlight generated a reflected lenticular reflex without light loss (Fig. 3C,E).

We previously introduced an advanced technique using intracameral

illumination in eyes with poor red reflex or diabetic retinopathy (Lee et al. 2012; Jung et al. 2013). In addition to our previous reports, the intracameral dynamic spotlight illumination provided real-time, three-dimensional high-quality images to guide the cataract procedures in eye with corneal opacity, small pupil or advanced cataract. The intracameral illumination does not need any additional instrument or time, and the only needed is just inserting the illuminator through the paracentesis wound, which is usually made in routine cataract surgery. The light probe could be used as a nucleus manipulator, although using the illuminator was not as efficient as using a nucleus manipulator such as a chopper. The intracameral illuminator might be used together with capsular staining or with iris dilating devices.

The endoillumination exposure could be associated with an increased risk of retinal phototoxicity (Michels et al. 1992; Koch et al. 1993). We used DORC Xenon BrightStar illumination system and 23 g-standard illumination probe (DORC, Ziudland, Netherlands) with standard setting of 420 nm filter and 357 mW/cm^2, in which the luminosity was adjustable and the filter was changeable. Nonetheless, the distance between the light source and posterior pole is much longer than the 3.0–7.0 mm during conventional vitrectomy. In addition, there might be less macular phototoxicity caused by intracameral horizontal illumination than coaxial microscope direct illumination. Therefore, the risk of phototoxicity may be almost completely absent.

Good visualization of the lens structures is essential for safe and effective performance of phacoemulsification cataract surgery. During challenging phacoemulsification cataract surgery in eyes with corneal opacity, small pupil or advanced cataract, the intracameral dynamic spotlight illumination offered real-time, 3-dimensional, high-quality lens images. Excellent visibility of the lens structures including the capsular details seemed to be very useful in the challenging cases. Even without anterior capsule staining or pupil expansion device, this novel technique simplified the challenging cataract surgery.

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