Case Series

Slit-beam retro-illumination assisted phacoemulsification for cataract with coexisting corneal opacity

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Abstract

Introduction: We describe a novel surgical technique of slit-beam retro-illumination assisted phacoemulsification for cataract with coexisting corneal opacity.
Cases: We present two cases with cataract and coexisting opacity, who underwent slit-beam retro-illumination assisted phacoemulsification and further application of same process in 12 patients.
Conclusion: This technique is safe and provides excellent visualization during cataract surgery in patients with corneal opacities.

Key words: Slit-beam, Retro-illumination, Corneal opacity, Phacoemulsification.

Introduction

Corneal opacification is a major cause of blindness in developing countries. The triple procedure involving simultaneous penetrating keratoplasty and cataract surgery is the standard treatment of coexisting cataract and corneal opacity (Inoue Y, 2001; Shimmura S, 2003). However, this surgery carries intraoperative and postoperative complications that may impact the overall outcome of treatment. It has been demonstrated that cataract surgery alone can be an effective therapy in these patients (Kusumesh R, 2020). Cataract extraction and intraocular lens (IOL) implantation has been challenging in coexisting corneal opacity. In order to achieve better anterior segment visualization, several techniques have been developed (Pandey SK, 2000; Bhartiya P, 2002). Here, we discuss our experience on retro-illumination using slit-beam during the cataract surgery coexisting with corneal opacity.

Case summary

Case 1: A 67-year-old man presented with diminution of vision in both eyes. The best corrected visual acuity (BCVA) were 6/60 in right eye (RE) and 6/36 in left eye (LE). Slit lamp examination showed nuclear cataract (NO4, NC4, LOCS III) with diffuse nebulo-macular corneal opacity. The medical records revealed that he had been treated for carcinoma prostate and consequently developed radiation keratopathy. Case 2: A 49-year-old woman presented with BCVA of 3/60 in RE and hand motion in LE. The ocular examination revealed nuclear sclerosis and post subcapsular cataract (NO3 NC3 P4) in RE with leucomatous central corneal opacity while LE had adherent leucoma with cataract. Phacoemulsification with IOL implantation was performed in RE, while LE was enrolled for triple procedure. The intraocular pressure, ocular fundus and B-scan ultrasonography were normal in both patients.

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Surgical technique

Under peribulbar anesthesia, 2.8 mm temporal clear corneal incision was made, and the anterior capsule of the lens was stained with 0.1% trypan blue (Vision Blue, DORC. International). However, improvement of anterior capsule visibility was not enough to perform continuous curvilinear capsulorhexis (CCC) [Fig. 1 A, B]. Since the corneal opacity obscured the visibility inside the eye, resulting in unsuccessful CCC. So, we chose to improve visualization by using slit-beam assisted retro-illumination (SBAR) [Fig. 1 C, D]. The slit-beam was produced with the help of beam splitter in Moller Wedel operating microscope. In this technique, a slit-beam of fixed-width approximately 2.5 mm was incident upon the cornea. Consequently, the resultant reflected light enhanced the fundus red reflex on the opposite side of the incident slit-beam, thus improving the visualization of anterior capsule. Thereafter, the anterior chamber was deepened with an ophthalmic viscosurgical device (OVD). To perform CCC in temporal quadrant, the slit-beam was placed on nasal cornea and changed vice versa. [Fig.2 A]. This process was repeated so as to enhance the visualization at each step of cataract surgery. Following hydro procedures, phacoemulsification was performed using stop and chop method. Cortical aspiration and IOL implantation were also completed using SBAR [Fig.2 B, C, D] (Koch PS, 1994). No complications were noted at any step of phacoemulsification. At 4 weeks follow-up, the BCVA of operated eye was 6/12 and 6/24 in case 1 and 2 respectively.

The same technique was applied in 12 patients with corneal opacity [nebulo-macular (n=7), leucomatous (n=5)] of various etiologies. Mean age was 61.16± 6.4 years. Preoperative vision was <6/60 (range, HM to 6/60) and all patients had improvement in vision at the end of 6 weeks (P.021) [6/12 (n=2), 6/18 (n=6), 6/24 (n=4)].

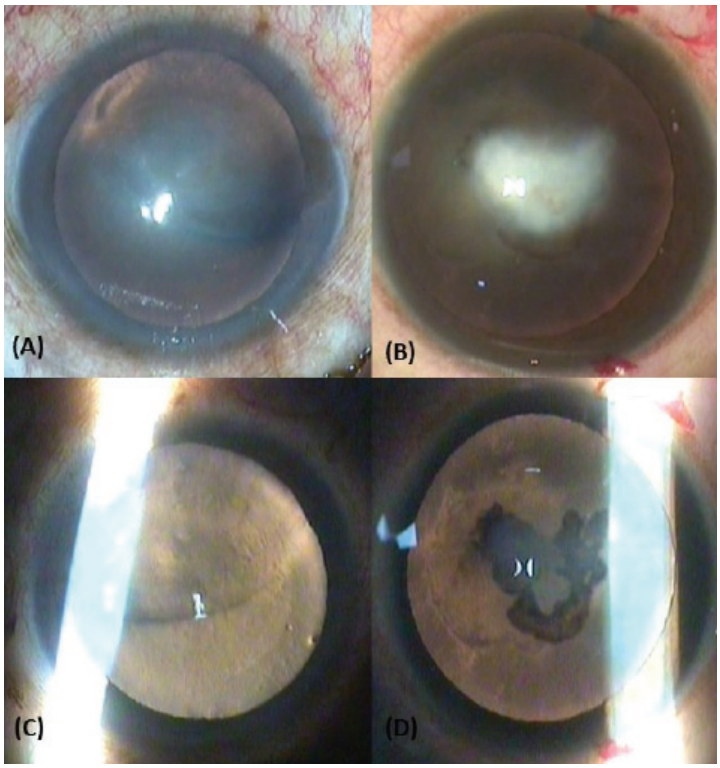

Figure 1. Visualization of anterior segment. Case 1 (A), Case 2 (B) under standard retro-illumination of surgical microscope and case 1 (C) case 2 (D) under slit-beam assisted retro-illumination

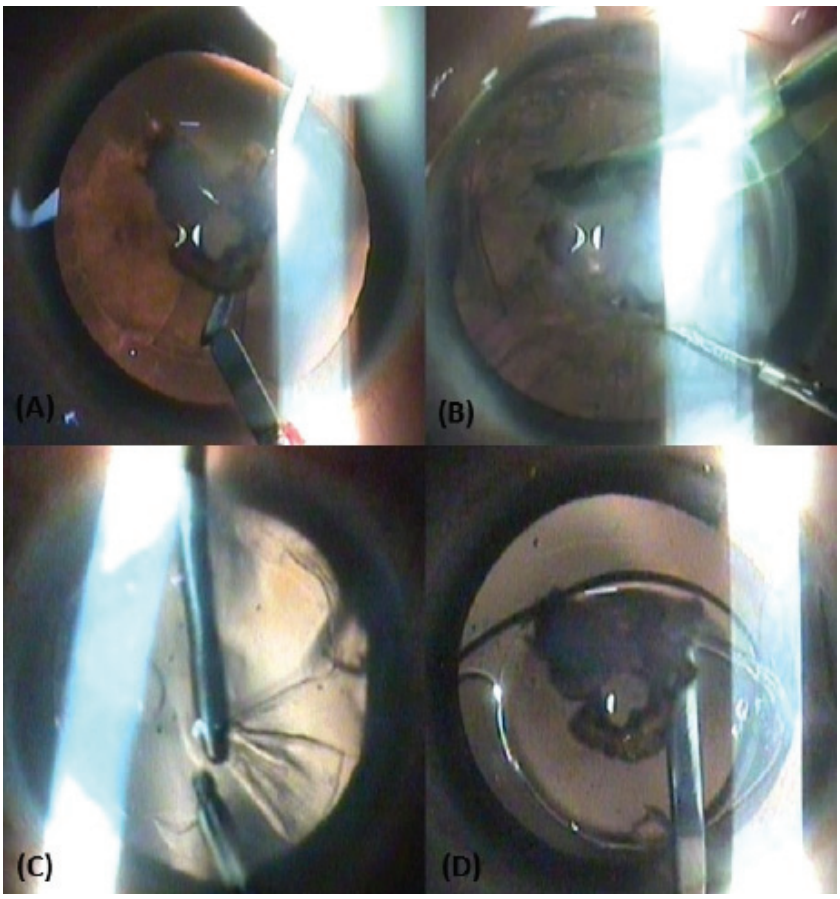

Figure 2: Surgical steps under the enhanced visibility of slit-beam assisted retro- illumination. (A) anterior capsulorhexis, (B) phacoemulsification of nucleus, (C) cortical aspiration using bimanual, (D) IOL implantation.

Discussion

Good visualization of the lens structures is essential for safe and effective performance of phacoemulsification with IOL implantation. However, in cases of corneal opacity, a successful capsulorhexis and phacoemulsification may be challenging because of poor visualization of the lens anatomy.

Various techniques for improving the capsule visualization have been described in literature. The dye assisted techniques (Indocyanine green or Trypan blue) improve the anterior capsule visibility, but is insufficient for completing the subsequent surgical procedures (Melles GRJ, 1999; Pandey SK, 2000; Bhartiya P, 2006, Panda A, 2012). Other techniques such as intracameral, intravitreal endoilluminators and transcorneal illumination assisted phacoemulsification have been shown to improve the visualization at each step of procedure (Nishimura E, 2004; Nishimura A, 2003; Farjo AA, 2003). Although these techniques overcame most of the problems of the scattering illumination by surgical microscope, they were limited by other problems such as difficulty in holding illuminator in anterior chamber, inability to obtain a normal red reflex from the ocular fundus and possibility of retinal toxicity (Saragas S, 1984; Michels M, 1992; Koch FH, 1993; Mansour AM, 1993; Bhattacharjee K, 1999). In our cases, coaxial retro-illumination was adopted in order to improve

the visualization by standard illumination of surgical microscope; however, visualization proved inadequate which was circumvented by slit- beam assisted retro-illumination. SBAR helps in improving visibility through the corneal opacity by preventing scattering of light. Retro-illumination has always been an important tool for slit lamp examination. It is based on the principle that when external light strikes the retina, it creates a glow behind the opacity in media. However, when it is used with surgical microscope in presence of corneal opacity, the obtained glow remains suboptimal. By using SBAR, an increase in image contrast and resolution was found (Saragas S, 1984). By changing the position of slit-beam, we obtained adequate visibility during each step of phacoemulsification. In our all cases, same technique provided sufficient intracameral illumination and visibility through the opaque cornea. This technique is cheap and does not require any additional instruments. In addition, unlike the technique described by Farjo et al, SBAR is a hands-free approach. A major limitation of this technique is its poor flexibility and dependency on a red reflex (Farjo AA, 2003). Thus, it may not be applicable to the eyes with undilated or partially dilated pupil, advanced or white cataracts, and eyes with vitreous hemorrhage.

In conclusion, the technique described herein allows cataract surgery to be performed safely in the presence of corneal opacity. Moreover, it is simple and cheap to be performed in developing countries where burden of corneal opacity is high with paucity of good quality donor cornea.

References

Bhartiya P, Sharma N, Ray M, Sinha R, Vajpayee RB (2002). Trypan blue assisted phacoemulsification in corneal opacities. Br J Ophthalmol; 86:857–9.

Bhattacharjee K, Bhattacharjee H, Goswami BJ, Sarma P (1999). Capsulorhexis in intumescent cataract. J Cataract Refract Surg; 25:1045–7.

Farjo AA, Meyer RF, Farjo QA (2003). Phacoemulsification in eyes with corneal opacification. J Cataract Refract Surg; 29: 242-5

Inoue Y (2001). Corneal triple procedure. Semin Ophthalmol; 16:113-8.

Koch FH, Schmidt HP, Mönks T, Blumenröder SH, Haller A, Steinmetz RL (1993). The retinal irradiance and spectral properties of the multiport illumination system for vitreous surgery. Am J Ophthalmol; 116:489-96.

Koch PS, Katzen LE (1994). Stop and chop phacoemulsification. J Cataract Refract Surg; 20:566-70.

Kusumesh R, Ambastha A, Sinha BP, Bhasker G, Mohan N, Kumar S (2020). Long-Term Visual Outcome in Surgical Management of Cataract Coexistent with Corneal Opacity in One-Eyed Patients. Asia Pac J Ophthalmol (Phila).

Mansour AM (1993). Anterior capsulorhexis in hypermature cataracts [letter]. J Cataract Refract Surg; 19:116–7

Melles GRJ, de Waard PWT, Pameyer JH, Beekhuis WH (1999).Trypan blue capsule staining to visualize the capsulorhexis in cataract surgery. J Cataract Refract Surg; 25:7–9

Michels M, Lewis H, Abrams GW, Han DP, Mieler WF, Neitz J (1992). Macular phototoxicity caused by fiberoptic endoillumination during pars plana vitrectomy. AM J Ophthalmol; 114:287-96.

Nishimura A, Kobayashi A, Segawa Y, Sugiyama K (2003). Endoillumination-assisted cataract surgery in a patient with corneal opacity. J Cataract Refract Surg; 29:2277-80.

Nishimura E, Kageyama T, Yaguchi S, et al (2004). Intracameral illumination during

phacoemulsification cataract surgery in patients with corneal opacity. [Japanese] Atarashii Ganka; 21:97–101.

Pandey SK, Werner L, Escobar-Gomez M, Roig-Melo E, Apple D (2000). Dye-assisted cataract surgery enhanced cataract surgery. Part 1: anterior capsule staining for capsulorhexis in advanced/white cataract. J Cataract Refract Surg; 26:1052–9.

Panda A, Krishna SN, Dada T (2012). Outcome of phacoemulsification in eyes with cataract and cornea opacity partially obscuring the pupillary area. Nepal J Ophthalmol; 4:217-23.