

Translimbal Intraocular Endoillumination during Cataract Surgery (New technique)

Purpose: To describe a technique for intraoperative examination of macula and posterior capsule during phacoemulsification surgery in eyes with dense cataract.

Setting/Venue:

Department of Ophthalmology, Hamad Medical Corporation, Doha-Qatar

Methods:

Consecutive case series; 36 patients (42 Eyes) with dense cataract and obscured fundus view, no recent data recorded about macular status, and preoperative macular assessment was not conclusive by Ophthalmoscopy, B-Scan Ultrasound and OCT. All patients were consented for cataract surgery and possible additional vitreoretinal surgical procedure if indicated. Fundus examination was done during phacoemulsification by Translimbal insertion (through limbal side-port) of endo-light probe (23 Gauge) after Irrigation/Aspiration (I&A) just prior to IOL implantation, capsular-bag expanded by viscoelastic to accommodate endo-light probe insert. Posterior capsule status checked by Endolight using operating microscope lens system only however, macula checked by Endolight with assistance of a vitreoretinal viewing lens system. Three types of vitreoretinal viewing lens system used: EIBOS Erected Image Binocular microscope, Re-sight 700 from Carl Zeiss, and Peyman-Wessels-Landers 132 D Upright Vitrectomy Lens.

Results:

Forty-two eyes (25 right and 17 left) / 39 patients (27 males, 15 females). Mean age 59 years (47-78 years). Fourteen patients (18 eyes) diabetics, Preoperative VA of $\leq 6/60$ in all Patients, Cataract Density assessed clinically by grade of fundus visualization, in all selected cases only optic disc and/or major vessels could be seen or worse. Intraoperative fundus comorbidity discovered and concurrent intravitreal injections done in eight eyes (19%): seven eyes have Diabetic Macular Edema, and single eye with hemorrhagic choroidal neovascular Membrane (CNVM) due to age related macular degeneration. No complications occurred in relation to Endoillumination. Posterior Capsule visualization improved significantly and intracapsular lens implanted in all cases

Conclusions:

Endo-illumination during phacoemulsification has an enhanced view to both Macula and Posterior Capsule. No extra incision required.

Introduction:

Cataract extraction with lens implantation is a frequently performed surgical procedure worldwide; more than 9.5 million cataract surgeries performed worldwide each year ⁽¹⁾.

Up to 29% of eyes, undergoing cataract surgery may have a copathology that can cause a guarded prognosis ⁽²⁾.

Retinal Pathologies like diabetic retinopathy, age-related macular degeneration, and retinal vein occlusions aggravated by cataract surgery. Therefore, retinal diseases with the potential for progression should be evaluated and treated prior to cataract surgery. With careful preoperative planning, attention to details during surgery and close postoperative follow up, these eyes may have visual improvement following cataract surgery ⁽³⁾.

However, in dense cataract, preoperative evaluation of the retina could be incomplete, unrecognized retinal pathology may be a cause of unsatisfactory visual outcome following cataract operation and certain retinal diseases may be exacerbated by cataract surgery.

Multiple retinal conditions may impact cataract surgery outcomes, including disorders such as: Diabetic macular edema (DME), Retinal vein occlusion (RVO), Uveitis, Epiretinal membrane formation, in addition, peripheral retinal lesions may also have bearing on complications. Peripheral findings that may be relevant to postoperative outcomes include lattice degeneration, retinal breaks, operculated holes, cystic retinal tufts and the whole family of pathologies related to vitreous traction ⁽⁴⁾.

Posterior segment visualization is an essential step in preoperative cataract assessment to rule out ocular co-pathologies that can be adversely hidden by dense cataract such as diabetic retinopathy, Age related macular degeneration or peripheral retinal tears. B-scan ultrasonography is an important diagnostic tool used to rule out certain gross retinal pathologies such as retinal detachment, posterior staphyloma, and vitreous hemorrhage ⁽⁵⁾ but it will not sufficiently be adequate to check for minute abnormalities. Preoperative fundus assessment usually done by using direct or indirect ophthalmoscopy and it may be hazy or completely indistinct in patients with dense lens opacification. Fundus Examination of the fellow eye may show a hint in bilateral vitreoretinal conditions; however, some pathologies are uniocular or asymmetrical.

In this case-series study, I developed a new technique to assess posterior segment intraoperatively during cataract surgery without modifying cataract surgery in eyes with preoperative fundus invisibility and this might help quick surgical decision for prompt treatment of retinal co-pathologies and theoretically improve prognosis.

Methods:

This case series study carried out at Hamad Medical Corporation in ophthalmology Department in Doha-Qatar over a period between January/2017 and June/2017.

Eyes included in the study had dense or mature cataract in which the fundus was not visible or obscured enough to prevent adequate assessment of the posterior pole. For all study eyes, no gross vitreoretinal pathology indicated on B-scan ultrasonography.

All surgeries performed by a single surgeon using the Infinity Phaco machine (Alcon), and Phacoemulsification was performed through a temporal clear cornea incision. Anterior capsule staining by Trypan-blue routinely used. Phacoemulsification performed by Divide and Conquer technique in all eyes, aspiration of cortex done bimanually, viscoelastic injected to deepened and inflate Capsular Bag, so capsular bag accommodate Endolight probe. Endolight probe inserted through side-port into middle of capsular bag, a vitreoretinal viewing system used to visualize posterior segment, posterior capsule details could also visualized by Endolight but with microscope only. A single piece acrylic posterior-chamber intraocular lens implanted in the capsular bag. Intravitreal Ranibizumab injection required in certain cases and injected 3.5 mm behind superotemporal limbus.

Vitreoretinal viewing systems used: EIBOS Erected Image Binocular microscope, Re-sight 700 from Carl Zeiss, and Peyman-Wessels-Landers 132 D Upright Vitrectomy Lens

Results:

Forty-two eyes (25 Right and 17 Left) of thirty-nine patients (16 Females and 23 Males) were included in the analysis. The mean (SD) age was 64.6 (13.3) years (range: 53 to 81 years). Sixteen (38%) had type-2 diabetes mellitus. All patients had no history of vitreoretinal surgery, but seven patients (17%) had intravitreal injection done not less than 3 months prior to cataract surgery. Topical Anesthesia applied in thirty-six eyes and Subtenon anesthesia in six eyes. Postoperative follow-up of the operated eyes was 30 days. Preoperative VA \leq 6/60 in all patients, OCT imaging obscured by cataract, B-Scan revealed normal vitreous and retina in all patients. Intraoperative Posterior Capsular thickening and Capsular Polishing done in six Eyes (14%). Intraoperative retinal comorbidity discovered in eight eyes (19%), 7 eyes have DME and one eye has AMD (macular drusens & hemorrhagic spot), and all eight eyes have intravitreal injection of Ranibizumab during cataract surgery.

Factor	Value
Age	53 to 81 years (Mean=64.66)
	Male 23 (64%)
	Female 16 (36%)
	Right Eye (25) (60%)
	Left Eye (17) (40%)
Preop. VA	< 6/60 (100%)
Diabetes	16 patients (18 eyes) 43%
Previous Retinal Surgery	0
Previous Intravitreal Injection	7 (17%)
Anesthesia	36 eyes (Topical), 6 eyes (Subtenon)

Discussion:

Indirect ophthalmoscopy is the traditional method for fundus examination during cataract surgery however; the fundus view restricted by image size (small magnification) and image inversion. I described a new technique to examine vitreoretinal compartment during phaco-surgery by Translimbal Endoillumination and I used Xenon Bright Star Endoilluminator system 23-G from DORC (Figures 1 & 2)



*Figure 1 Xenon Bright Star
Endoilluminator system 23-G
from DORC*



Figure 2 End probe 23-G

It has greatly improved view of intraocular structures during cataract surgery and has a substantial impact upon surgeon decision during cataract surgery if need to do more surgical interventions.

Fundus examination is essentials in certain patients during cataract surgery; coexisting retinal disease makes cataract surgery a greater challenge than it would normally be for the surgeon and a riskier prospect for the patient, but ophthalmologists who perform cataract surgery can minimize the impact of this extra disease burden on visual outcomes by modifying their pre, peri, post-operative routines ⁽⁶⁾.

It is essential to relate a cataract to the degree of visual loss; the clinical examination should include a comprehensive assessment of the posterior segment. The surgeon must inform the patient that cataract surgery will only correct the cataract, but not associated undiagnosed ophthalmic conditions that could limit vision prognosis ⁽⁶⁾. In our study, preoperative detailed fundus examination, macular imaging was unfeasible due to high cataract density therefore and visual acuity correlation to cataract was not possible.

In our study, all patients have been consented for cataract surgery and for possible additional surgical procedure during phaco surgery if treatable co-pathology discovered during surgery.

Several studies confirmed that Age-related macular disease (AMD) and diabetic maculopathy were the main causes of visual disappointment after phacoemulsification ^(7,8,9). By Translimbal Endoillumination in this study, eight patients (17%) revealed to have macular pathology; seven of them with Diabetic Macular Edema and one had Age-related Macular Degeneration and all had prompt intravitreal Ranibizumab injection

All surgeries in this study done by same surgeon, under topical anesthesia except for six cases by Subtenon anesthesia.

Two main steps of technique:

- A. Intra-cameral (Inside Anterior Chamber) Endolight insertion with microscope lens viewing system : an improved Visualization of Posterior Capsule(PC), PC looks less transparent (Figure 3) and it more transparent by direct microscope illumination only(Figure 4). Theoretically, it is due to direct endo light reflection from Anterior Surface of PC (Figure 3). This technique help to confirm if PC integrity was questionable.

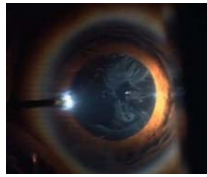


Figure 3 Less transparent PC in Translimbal endo Illumination due to light reflection from PC

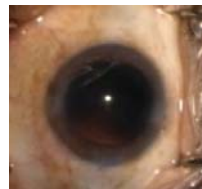


Figure 4 Transparent PC in Microscope Illumination

- B. Intracapsular Endolight insertion after capsular bag inflation by viscoelastic prior to IOL Implantation and use of vitreoretinal viewing system (image)

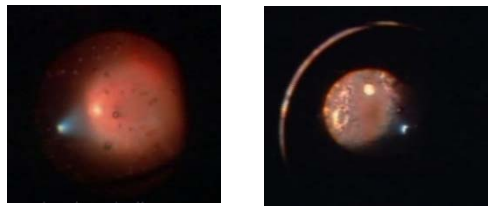


Figure 5, 6 Intracapsular Endolight and intraoperative Fundus view

Fundus view in Translimbal Endoillumination is comparable to Trans-Scleral Endoillumination except for limited manipulation of the probe within capsular bag.

Type of the viewing system used could have an influence upon the quality of fundus view by Translimbal Endoillumination, in this study 3 kinds of viewing systems used; EIBOS Erected Image Binocular microscope, Re-sight 700 from Carl Zeiss, Peyman-Wessels-Landers 132 D Upright Vitrectomy Lens, the fundus view was superior in Zeiss reisght viewing system.

Conclusion: Translimbal Endoillumination during phacoemulsification has an improved view to fundus and posterior capsule. Image size and resolution controlled by viewing system, and microscope, no extra incision needed. Immediate Decision could made to do additional surgical interventions, or refining phaco surgery depending on posterior capsule status.

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