·Clinical Research·

Evaluation of early results of quick-chop phacoemulsification in the patients with high myopic cataract

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Abstract

• AIM: To assess the early surgical outcomes of quick-chop phacoemulsification technique in patients with high myopia.

• METHODS: The data of patients with high myopia who underwent quick-chop phacoemulsification were reviewed retrospectively. There were 42 eyes of 31 patients. The axial length was more than 26 mm in all eyes. All eyes underwent quick-chop phacoemulsification surgery with the placement of an intraocular lens (IOL) in the capsular bag. Postoperative visits were performed at 1, 3d; 2wk, 1mo. Early postoperative best corrected visual acuity (BCVA), preoperative and postoperative corneal endothelial cell density (ECD), central corneal thickness (CCT) and postoperative complications were assessed. Paired sample *t*-test or Wilcoxon tests were used to compare data between preoperative and postoperative data.

• RESULTS: There was no statistically significant difference between preoperative and postoperative ECD and CCT. Retinal detachment was developed in one eye at postoperative first day. There was an iris prolapsus from side port insicion.

• CONCLUSION: Quick -chop phacoemulsification technique is a safe surgical technique. However we can encounter some complications in high myopic eyes due to histopathological differences. Both side port and clear corneal tunnel insicion size is crucial for preventing postoperative complications. If any persistent leakage is noticed, suture should be placed.

• **KEYWORDS:** high myopia; cataract; quick-chop phacoemulsification; intraocular lens
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INTRODUCTION

High degenerative axial myopia is described as eyes with an axial length greater than 26 mm and spherical equivalent -6.00 diopters (D), and this disease is generally related to degenerative changes in sclera, choroid, retina, and vitreous. This disease may cause slightly thinner and flatter than normal eye tissue. The sclera is also thin and abnormal [1-5]. Derdoy [6] demonstrated that there is smaller average diameter of collagen fibers and Komai and Ushiki[7] revealed that the fibrils demonstrate wider interfibrillar separation. Cataract, which is generally posterior subcapsular or nuclear, occurs more frequently at an early age in high myopic patients and progresses more rapidly[8-10].

Phacoemulsification is the main choice of most ophthalmologists for surgical treatment of elective cataract and high myopic cataract. But ultrasound energy during this surgery can cause endothelial cell (cell/mm^2) loss, tissue damage, and other complications particularly in hard cataracts[11-13].

To best of our knowledge, previous studies documented especially the late complications of phacoemulsification surgery. In our study we evaluated the early surgical outcomes and complications of quick-chop phacoemulsification technique in patients with high myopia. The aim of this study is to analyze surgical safety, effectiveness, outcomes, and complications after small incision quick chop phacoemulsification.

SUBJECTS AND METHODS

Study Design The retrospective study comprised 42 eyes of 31 patients (11 males, 20 females) who admitted at our hospital between August 2008 and May 2011 and were

Table 1 Parameters for linear longitudinal ultrasonography

Variables	Linear longitudinal ultrasonography
Longitudinal ultrasound power (%) (burst; width 40ms; off time 30ms)	40% (linear)
Vacuum limit (mm Hg)	450 (fixed)
Aspiration flow rate (cm^3/min)	30 (fixed)

diagnosed with high myopic cataract. Written informed consent was obtained from all patients. The study protocol was approved by Institutional Ethics Committee.

All eyes with an axial length greater than 26 mm were included in this study. All eyes had endothelial corneal cell count greater than 1750 mm^2. The grading of cataract was performed in line with the lens opacities classification system III (LOCS III). Patients with grade III and IV cataract were included in the study. Patients with history of previous inflammation, trauma, intraocular pathology, intraocular surgeries, keratoconus, endothelial dystrophy, glaucoma and high myopic clear lens were excluded from this study.

Retrospective chart evaluation included pre-, intra- and post-operative data. Postoperative data was recorded at 1, 3d; 2wk, 1mo postoperatively. Ophthalmological examination included uncorrected visual acuity, slit-lamp biomicroscopy, intraocular pressure (IOP) measurement with goldmann applanation tonometry, fundus examination with indirect ophthalmoscopy after mydriasis, autokeratometer to calculate the corneal power, corneal endothelial cell density (ECD) and central corneal thickness (CCT) assessment. Preoperative IOL power calculation was done using SRK-T Formula in all patients. Combination A/B scans method was used in eyes with dense cataract and poor fixation. Additionally, best corrected visual acuity (BCVA) was performed postoperatively.

The corneal ECD and CCT were measured preoperatively, at 1d, 2wk, and 1mo postoperatively, using the non-contact specular microscope (Topcon SP-3000P; Specular microscope, Topcon corporation, Tokyo, Japan).

The Alcon Infiniti vision System (Alcon, Fort Worth, TX, USA) was used in all cases, and all surgeries were performed by the same surgeon. For all patients, a Micro Tip 0.9 mm ABS phaco tip (30° flared turboSonics) was used. The settings are shown on Table 1.

Surgical Technique All patients were operated under topical anesthesia (Alcain 0.5% Alcon-Couvreur n.v. Puurs, Belgium) and the quick-chop phacoemulsification technique was performed. Phacoemulsification was performed through a 2.4 mm sclerocorneal tunnel incision at 11 o'clock and side ports were prepared with 20 gauge MVR blade at 9 and 3 o'clock. Air bubble was injected into the anterior chamber lens capsule stained by Trypan blue (Bio-blue, Bio-Tech Ophthalmics Pvt. Ltd. Gandhinagar, India). Viscoat (Alcon Loboratories Inc, Fort Worth, Texas, USA) ophthalmic viscosurgical device (OVD) (sodium chondroitin sulfate 4.0% -sodium hyaluronate 3.0%) was used to reform and stabilize the surgical planes and protect the corneal endothelium. A 5.5-6.0 mm continuous curvilinear capsulorhexis was performed with a 26-gauge needle.

Hydrodissection was carried out in all cases to ensure free rotation of the nucleus. Phacoemulsification was performed using quick-chop technique and the phacoemulsification mode was linear longitudinal ultrasound. The phacoemulsification parameters were shown on Table 1. Foldable hydrophobic acrylic IOL was implanted into the bag after OVD (Healon, Abbott medical optics Inc, Santa Ana, USA) injection in all eyes.

The postoperative treatment included antibiotic drops (Vigamox Alcon Laboratories, Inc. Fort Worth, Texas, USA) and corticosteroid drops (Pred forte Allergan Pharmaceuticals, Mayo, Ireland) which was applied six times daily for three weeks.

Statistical Analysis Statistical analysis was performed using SPSS version 20 for Windows (SPSS Inc, Chicago, Illinois, USA). Distribution of continuous variables was assessed with one-sample Kolmogorov Smirnov test. Paired sample t-test or Wilcoxon test was used to compare data between preoperative and postoperative data. Two-tailed P<0.05 was considered statistically significant.

RESULTS

The mean age and axial length and IOL power and postoperative vision and postoperative spherical equal refraction values of high myopic patients were shown on Table 2. The mean age and axial length and IOL power and postoperative vision and postoperative follow-up spherical equal refraction values at 1, 3d; 2wk, 1mo respectively were 62.86±14.79, 28.87±1.99, 5.10±5.37, 0.39±0.23, and -2.78± 1.26.

The mean IOP, corneal ECD, and CCT values were given on Table 3. There was no statistically significant difference in terms of the preoperative and postoperative IOP, corneal ECD, and CCT values for high myopic patients (P>0.05 for all).

We did not observe pre-, intraoperatively complications and did not encounter any intraoperatively complications arising from the vacuum that is around 450 mm Hg. However at first postoperative day we observed an iris prolapsus from side port incision at 2 o'clock in only one eye. In this case concurrently retinal detachment (RD) had occurred in the same eye and decreased BCVA was observed, and vitreoretinal surgery was performed. After surgery BCVA was found 2/10 Snellen chart.

Table 2 The mean age and axial length and intraocular lens power and postoperative vision and postoperative spherical equal refraction values of high myopic patients

Variables	Patients (n=42)
Age (a)	62.86±14.79
Axial length (mm)	28.87±1.99
Intraocular lens power diopter (D)	5.10±5.37
Postoperative vision (Snellen chart)	0.39±0.23
Postoperative equal spheric refraction diopter (D)	-2.78±1.26

Table 3 Preoperative and Postoperative the mean IOP, corneal ECD and CCT values of high myopic patients

Variables	Preoperative	Postoperative	P
IOP [mm Hg (Appl)]	14.29±2.72	14.33±3.35	0.929
ECD (cells/mm^2)	2398.45±258.50	2382.02±292.35	0.461
CCT (μm)	478.33±78.18	493.19±17.61	0.235

IOP: Intraocular pressure; ECD: Endothelial cell density; CCT: Central corneal thickness.

DISCUSSION

To the best of our knowledge, our study was one of preliminary studies which evaluated the early surgical outcomes and complications of quick-chop phacoemulsification technique in patients with high myopia. The main findings of this study were that, 1) there was no statistically significant difference between the preoperative and postoperative ECD values for high myopic patients (P= 0.461). 2) There was no statistically significant difference between the preoperative and postoperative CCD values for high myopic patients (P=0.235). 3) We observed RD in one eye.

Domingues *et al* [14] found that there was no statistically significant difference in respect of the central corneal ECD between "divide and conquer" and "quick chop" phacoemulsification techniques in the first postoperative month. Fakhry and El Shazly [15] revealed that torsional and combined torsional-conventional ultrasound modes were safe in hard cataract surgery regarding effect on corneal endothelium. The results of the present study support the findings of the previous studies and clinical observations on ECD and CCT changing after cataract surgery.

After cataract extraction, several risk factors of rhegmatogenous RD have been recognized such as male sex, younger age, ethnic origin or race, increased axial length, a history or family history of RD, lack of an intact posterior capsule, vitreous loss, vitreoretinal pathological features (*i.e.* lattice degeneration or ocular trauma after surgery)[16-18]. An intraocular lens implantation was reported to be protective compared to aphakia [19]. The presence of intact posterior capsule during operation is the cornerstone in reducing the risk of rhegmatogenous RD [20,21]. After coaxial phacoemulsification, the rate of RD in high myopic patients is 2.7% and increased incidence and risk of RD in patients younger than 50y of age was observed [22]. Some researchers reported that the retinal changes in high myopia increase the risk of RD after cataract surgery[19, 23-25] whereas the results of other studies did not support these findings [19,26,27]. Based on the present study and previous data, there is an obvious controversy about the risk of RD after cataract surgery. In the light of our experience and the results reported by literature, incision size and location were not mentioned as a risk factor for RD at early postoperative period. We observed RD in one eye at first postoperative day.

Retrospective study design, limited sample size and short follow-up period are main limitations of the present study.

In conclusion, quick-chop phacoemulsification technique is a safe and effective technique for the treatment of cataract in high myopic patients. However we can encounter some complications in high myopic eyes due to underlying histopathological disorders. We also have hypothesized that size of side ports, clear corneal tunnel insicion, suture placement (in cases with indications) to provide water tightness is crucial for preventing postoperative complications, though it is beyond the scope and the aim of the present study.

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