Evaluation of Plus 3 Ring Moria M2 Microkeratome Lasik in High K Reading Patient

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Abstract

Purpose: To evaluate the safety and reproducibility of using +3 Ring Moria M2 microkeratome (Mechanical Technology) with patients suffering from high K reading.

Setting: Eye Care Private Centre-surgery Centre, Jeddah, Saudi Arabia.

Methods: Data had been reviewed starting from 2005 up to 2010; with the aim to review and evaluate all the data and complications after using +3 Ring Moria M2 single use head 90 (110) microkeratome LASIK with very high K-reading patients.

Results: (Male and female eyes) total eligible eyes were 51 from 28 patients with gender distribution 58.71% (30 eyes) females and 41.29% (21 eyes) males. Population mean ± SD, sphere –3.65 ± 2.27, cylinder 1.66 ± 1.24, 116.74 ± 77.37, K2 score 47.17 ± 0.516 (range 47-48.25), K1 score 45.69 ± 1.53 (range 43.25-54.5). Optical zone of choice was 6.5 D.

Conclusion: Although the presence of new technologies including Femtosecond LASIK technology offering new advantages, the use mechanical microkeratome is still showing high safety profile if +3 Rings were used.

Key Words: Lasik – Femtosecond laser – Microkeratome.

Introduction

LASER in situ keratomileusis (LASIK) is becoming more reliable and safe intervention than before.

An ideal microkeratome for LASIK should consistently create a corneal flap of the desired thickness, thus exposing the stroma for laser ablation. Factors that determine the corneal flap thickness have yet to be studied. In general, the thickness of the flap plays a role in determining its stability. The thinner the flap, the less stable it is and the easier it wrinkles, which may lead to irregular astigmatism and loss of vision. On the other hand, a thicker flap could lead to a weakened cornea, because corneal strength is determined predominantly by the thickness of the remaining stromal bed after ablation [1-10].

Button holes are caused by abnormal lamellar cut during LASIK flap creation with either microkeratome or femtosecond LASIK [11-13]. There are a lot of risk factors associated with button holes including: Steep mean corneal curvature (K> 46.00 D), previous ocular surgery, attempted creation of thin flap (≤100mm), reduction in intraocular pressure, loss of suction, power decrease in the microkeratome meter and blade in perfection during passage of microkeratome [11-13] accident has been noted to be higher in the remaining (second) eye treated with microkeratome assisted flap [14-16].

Patients and Methods

This is a retrospective analysis. Eligible patients are those undergoing LASIK with high horizontal K-reading minimum 47 and maximum 49. Data were collected from my private clinic starting from 2005 to December 2010. Patients are excluded in case of incomplete records.

This retrospective, consecutive, non-randomized, case series included patients undergoing LASIK operated by Wavelight Allegretto Wave excimer laser device and Moria M2 (+3 rings). Patients received and signed a written informed consent prior to undergoing surgery.

Procedures:

In addition to general medical and ophthalmic histories and examination, preoperative measures included manifest refraction, Cylinder change, visual acuity, cycloplegic refraction, topography,
Measurement of flap thickness is routinely measured as safety prerequisite.

The laser operated at a 200kHz treatment rate with fast correction rate 4 seconds per diopter. The spot size was 0.68mm (FWHM), with Gaussian beam profile. The Wavefront-optimized excimer laser treatment with the Wavefront OptimizedTM refractive treatments (WaveLight Standard).

The optical zone was set to 6.00D, 6.50D and 7.00D according to manufacturer recommendations and approval [14].

All patients underwent the procedures based on Moria M2 head 110 Microkeratome. Routinely sterilized suction rings are used. The ring size of choice for all patients was +3.00 and Hinge size was 7.5.

All patients had undergone 1 10mm flap using the same blade for both eyes except 5 patients underwent procedures in one eye. Postoperatively, patients were instructed to instill gatifloxacin 4 times daily for 4 days and prednisolone acetate 1% 4 times daily for 7 days.

**Statistical analysis:**

Statistical package used was NCSS 7.1.8 version released April 2008 running on Widows Vista. Statistical significance was calculated using the Student t test (p<.05). Data are expressed as means ± standard deviation. Ranges are expressed in 95% confidence interval C.I. Correlations were calculated using linear regression model. This study is evaluating the safety of using +3 ring technology regardless the efficacy so no efficacy comparison is required.

**Results**

Fifty one eyes were retrieved from 28 patients with gender distribution 58.71% females and 14.29% males. Refer to Table (1), where demographic data are summarized. All patients were suffering from myopia. Fig. (1) demonstrates the distribution of patients over years. All the patients did not encounter any buttonholes.

It has been found that each patient had encountered 3 risk factors for button holes high K-reading >46.00D, use of the same blade high K-reading >46.00D, use of the same blade and thin Flap 90 (110m).

<table>
<thead>
<tr>
<th>Demography</th>
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<tbody>
<tr>
<td>Sphere mean ± SD</td>
<td>-3.65±2.27 D</td>
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<tr>
<td>Cylinder mean ± SD</td>
<td>-1.66±1.24 D</td>
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<tr>
<td>Axis mean ± SD</td>
<td>116.74±77.37 D</td>
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<tr>
<td>Pupil mean ± SD</td>
<td>6.26±6.99</td>
</tr>
<tr>
<td>Pachymetry mean ± SD</td>
<td>537.75±102.66</td>
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<tr>
<td>K2 mean ± SD (range minimum-maximum)</td>
<td>47.17±0.516 (range 46.25-48.25)</td>
</tr>
<tr>
<td>K1 mean ± SD (range minimum-maximum)</td>
<td>45.69±1.53 (range 43.25-54.5)</td>
</tr>
<tr>
<td>Optical Zone 6 number (%)</td>
<td>7 (13.73%)</td>
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<tr>
<td>Optical Zone 6.5 number (%)</td>
<td>42 (82.35%)</td>
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<tr>
<td>Optical Zone 7 number (%)</td>
<td>2 (3.92%)</td>
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**Discussion**

Laser in situ Keratomileusis (LASIK) is preferred by different refractive surgeons worldwide. Now the critical step of LASIK surgery is the creation of corneal flap [4-9]. The two common ways to create the flap are through the femtosecond (FS) laser or the mechanical microkeratome.

If a keratectomy has an irregular surface, no matter how irregular the surface might be, there is a perfect match in the underside of the flap. Therefore, if the flap is simply replaced the patient should return to the preoperative refraction and best cor-
rected visual acuity. Problems arise when the bed is altered with an attempted ablation such that the flap no longer matches the underlying stroma. This mismatch can lead to loss of correctable acuity.

Screening for risk factors such as steep corneas, previous ocular surgery, and avoiding the creation of thin flaps may reduce the incidence of buttonholes. Steep corneas have been described as being at higher risk for buttonholes as an increased amount of tissue is compressed by the microkeratome and buckling of this tissue may lead to an irregular cut [4]. Using a smaller ring or a FS laser in these eyes may decrease such risk. Using a new microkeratome blade on the second eye should be considered if the flap measurement of the first eye is noted to be thin. Surface ablation should also be considered in these eyes with high keratometry values and prior corneal surgeries.

FS laser technology for creation of the lamellar keratectomy may reduce the incidence of flap buttonholes [10]. However, FS laser-assisted keratectomy buttonholes have been associated with thin flaps (≤100μm), previous scars [9], epithelial plugs, or corneal facets through which subepithelial gaseous byproducts can escape [9], or when a rough flap dissection is performed.

Given the innate risks of lamellar surgery, it is important to prepare the patient for a potential flap complication prior to surgery. The patient should be informed preoperatively that a flap complication can occur and that in the event of an irregular flap, no laser ablation will be performed. This preparation will prevent the patient from panicking in the event of a flap abnormality and reduces the pressure on the surgeon to proceed with an ablation that may not be appropriate.

Recently during 2010, Espandar and Meyer had prospective comparisons of mechanical and PS laser microkentome in LASIK showing no significant clinical differences in final visual acuity after the management of complications. They found also complications are rare and several recent studies have identified risk factors and guidelines to help manage these complications [15].

Upon comparing these findings with relatively less recent comparison during 2005, done by Schallhorn, et al., a trend of decreasing flap complications using mechanical microkeratome LASIK surgery [15,16]. This increase the priority of updated guidelines to spread the experience more than switching to new technologies.

The motive for doing this current analysis is the scarcity of articles hitting the impact of using +3 rings in medical literature with more interest to evaluate the technologies like FS.

Recently Vertical gas breakthrough when using a FS laser for flap creation should be considered similar to a buttonhole. Risk factors for vertical gas breakthrough when using a FS laser include corneal scars or breaks in Bowman’s membrane and attempted thin flap (≤100μm) creation [16].

No single case of complications had been recorded after the use of +3.00 Ring Moria M2. During the previous regular ophthalmic surgery practice; high K-reading with surgery would complicate with button holes. This risk is higher if the K reading is >47.00D. All such cases used to be avoided from doing LASIK and preferred to have PRK (Photoretractive Keratectomy) as the only choice. Since 2005 after the use of +3 rings, I did not encounter any complication up to 48.25D.

Finally +3 rings succeeded in doing buttonhole-free LASIK keratectomy patients although the presence of combined 3 risk factors of high k-reading >46.00D, thin flap ≤100 and the same bade in both eyes.

Conclusion:

Although the presence of new technologies including FS technology offering new advantages, the use of mechanical microkeratome is still showing high safety profile if used properly.

References


