Femtosecond corneal lenticule extraction compared to conventional LASIK in refractive surgery

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NO FINANCIAL INTEREST
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FLEEx

- Femtosecond Lenticule Extraction (FLEEx) is a completely femtolaser LASIK. Combination of femtosecond laser flap and femtosecond extraction of optic lenticule

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Aim

Comparative estimation of corneal flap thickness in flaps formed with Moria microkeratome and with VisuMax femtosecond laser as well as refraction, visual acuity, changes of contrast sensitivity and higher order aberrations after LASIK and FLEEx operations for myopia and myopic astigmatism.
Methods

Two groups of patients, 70 eyes in each group

Group 1 - LASIK with Moria Evolution 3E mechanical microkeratome, M2SU 90
Group 2 - FLEX with Visumax femtosecond laser (Carl Zeiss Meditec)

Methods

- Moria Evolution 3E M2SU 90 microkeratome
- Visumax femtosecond laser
  - Standard energy level 150±10nJ
  - Planned flap thickness 120 μm
  - Lenticule edge thickness 15 μm
  - Optic zone diameter 6 mm

Methods

- MEL-80 excimer laser (Carl Zeiss Meditec)
  - 6 mm optical zone diameter, 8 ASA
- Visante OCT (Carl Zeiss Meditec)
  - High Resolution Corneal Quad mode
  - Flap thickness measurement at the center, 1, 2, and 3 mm from the center
Methods

- WASCA aberrometer (Carl Zeiss Meditec)
  - Malacara notation
  - 6 mm non-mydriatic pupil diameter

- CSV-1000 (VECTORVISION)
  Contrast sensitivity measurement

Results

Protocol of optical coherence tomography with thickness measurement of the flap formed with bionics 3E macrokeratome

Protocol of optical coherence tomography with thickness measurement of the flap formed during FLEX operation

Results

P<0.05

Corneal flap thickness (μm) at the cornea center and at 1, 2 and 3 mm from the center according to optical coherence tomography data
Results

Corneal flap thickness (µm) at the corneal center and at 1, 2 and 3 mm from the center according to optical coherence tomography data.

- 225 - 45 MicroaNica
- 225 - 45 Visumax

- 270 - 90 MicroaNica
- 270 - 90 Visumax

- 315 - 150 MicroaNica
- 315 - 150 Visumax
Day 1 after FLEX operation

Edge of the cornea flap

Days of the removed lens capsule

Results

DYNAMICS OF RMS HO, μm

Before surgery | 1 month after surgery

Group 1 - LASEK | Group 1 - FLEX

P<0.05
Results

DYNAMICS OF SPHERICAL ABERRATION Z(4,0), μm in Malacara notation

Before surgery vs 1 month after surgery

GROUP 1 – LASIK
GROUP 2 – FLEX

P < 0.05

Results

Group 1 – LASIK
Group 2 – FLEX

CDV-100 Contrast Sensitivity

BEFORE SURGERY

Spatial Frequency – (Cycles Per Degree)

1 MONTH AFTER SURGERY

Spatial Frequency – (Cycles Per Degree)
Conclusions

Unlike mechanical microkeratome, femtosecond laser VisuMax provides a possibility to perform FLEEx refractive operations without excimer laser and to create corneal flaps with accurately preset parameters of thickness, diameter and hinge width.

Conclusions

Use of FLEEx operation provides visual acuity improvement up to the level of preoperative best corrected visual acuity with restoration of preoperative contrast sensitivity parameters under mesopic conditions by 1 month after surgery.