Efficacy of trifocal intraocular lens: visual outcomes and patient satisfaction

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Abstract
Introduction: Phacoemulsification is gaining popularity for cataract removal and refractive lens exchange, and the continued evolution of equipment, techniques and intraocular lens. Multifocal intraocular lens (IOL) design, has resulted in the evolution of postoperative goals to include not only visual restoration but to improve patient satisfaction as well as visual outcomes and quality of life. The aim is to evaluate visual and refractive results following implantation of a trifocal diffractive intraocular lens (IOL) and to determine patient satisfaction and glasses independence. This was a prospective study enrolling 74 eyes of 42 patients undergoing lens removal surgery with implantation of trifocal diffractive Medicontur IOL (Liberty). Visual and refractive outcomes were evaluated preoperatively and 6-month postoperatively. Patient satisfaction, spectacle use, photic phenomena presence, and ease of performance of vision-related activities were assessed via questionnaire. 74 patients included in this study entirely patients finished the 6-month after surgery. 77% were males and 23% females, 84% of them with age ≤ 30 years old and 16% > 30 years old mean range of age (45.04 ± 12.3) years (19–69 years). 99% of them with glare absent while 99% of patient with no eyes discomfort, (100%) did not require glasses for near or far vision postoperatively. This table show difference between visual acuity of patients after and before surgery (P-value< 0.05), so there is a difference between VA for near before and after surgery, there was difference between refraction after and before surgery (P-value< 0.05) and refraction in spherical is better after surgery. In conclusion, implantation of the Medicontur trifocal IOL (Liberty) after lens removal surgery restores visual acuity with a minimal level of photic phenomena, better to doing normal everyday actions with no glasses, and with good satisfaction of patients after operation.

Key words: trifocal intraocular lens, visual outcomes, patient satisfaction

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Introduction
Cataract elimination and interchange of the refractory lens is popular acceptable and called Phacoemulsification. The tools, procedures and intraocular lens use in it are developing[1, 2]. So the intraocular lens (multifocal) project and its development lead to improve visual acuity, the satisfaction of patients and life quality[3, 4]. While Old-style lens use for a near or far vision for clearing it while multifocal lens use for clearing both near and far vision 2. So a patient who wants to correct presbyopia and leave use their classes so the preferable lens use for this correction is the multifocal lens. There are 2 types of multifocal lens: diffractive & refractive 5, in diffractive lens form extra focus for occurrence bright for near vision so it gives strong far and near vision 6, this strong near and far vision not sufficient for daily lifestyle as vision (50 - 70 cm) this type of vision is important nowadays due to use electronic tools 3. Another type is refractive in which there are multi areas with a similar refractive powerful so these multi areas deliver numerous concurrent focus ideas 6. The purpose of this study was to evaluate visual and refractive outcomes, patient satisfaction and glass independence following Medicontur multifocal diffractive aspheric hydrophilic acrylic IOL (Liberty) implantation following lens removal surgery for cataract and refractive lens exchange within six months follow up period.

Patients and methods
This is a prospective interventional non-randomized study that is carried out at Dar Alsalam private eye hospital in Baghdad from the 1st of March 2017 till 1st of March 2019 involving 74 eyes of 42 patients who underwent phacoemulsification for either cataract or refractive lens exchange (RLE) with implantation of spherical or toric Medicontur multifocal diffractive aspheric hydrophilic acrylic IOL (Liberty) with 6 months follow up period. Patients were excluded from the study if they had refractive opaqueness, corneal illness, glaucoma, pupillary illnesses, macular deterioration, myopia, uveitis, detachment of the retina, retinopathy in a diabetic and hypertensive patient, neural illness of optic nerve, any systemic complication or any patients not remain in our study. All the surgeries were performed by experienced surgeons under local anesthesia. A standardized surgical technique (phacoemulsification) was employed by using 2.6 mm pure corneal cut then multifocal lens insert in the capsular sack. After operation we give the patients ointment contain antibiotics and steroid, then checking patient by examination at one day then once weekly then once monthly and after 6 months from operation, assessment of visual acuity without glasses by decimal chart for near and far, examination by slit lamp, and refraction by Nidec auto refractometer was done before and six months after surgery. A questionnaire was used during the postoperative period to assess patient satisfaction in terms of surgical outcome, spectacles independence, presence of glare or halos and ease of performing some of the vision-related activities. Statistical analysis was done by SPSS 22 where frequency, percentage, mean and SD used for descriptive analysis of data, Chi-square used for the analysis of categorical variables and Wilcoxon test for continuous data with the abnormal distribution.

Results
74 patients included in this study all patients finished 6 months of follow up. 77% were males and 23% females, 16% of them age ≤ 30 years old and 84% of patients were> 30 years old mean range of age (45.04 ± 12.3) years (19–69 years). 99% of them with glare absent while 99% of patients with no eyes discomfort, (100%) did not require glasses for near or far vision postoperatively. All patients’ data after operation showed in table 1, visual acuity recorded by decimal and refraction in sphere-shaped equal in diopters.

Table 1: preoperative patients’ parameters.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>N</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>74</td>
<td>19</td>
<td>69</td>
<td>45.04</td>
<td>12.31</td>
</tr>
<tr>
<td>VA for far before surgery</td>
<td>74</td>
<td>0.1</td>
<td>0.6</td>
<td>0.234</td>
<td>0.14</td>
</tr>
<tr>
<td>Refraction Before surgery</td>
<td>74</td>
<td>9.00</td>
<td>4.50</td>
<td>0.1858</td>
<td>3.16</td>
</tr>
<tr>
<td>VA for near before surgery</td>
<td>74</td>
<td>0.1</td>
<td>1.0</td>
<td>0.650</td>
<td>0.31</td>
</tr>
</tbody>
</table>

Table 2 display the visual acuity of patients before and after surgery. This table show difference between visual acuity of patients after and before surgery (P-value< 0.05) and visual acuity is better after surgery. Also there is a difference between VA for near before and after surgery after is better than before.

Table 2: visual acuity before and after surgery in decimal.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>UDVA - Before</td>
<td>0.1</td>
<td>0.6</td>
<td>0.234</td>
<td>0.15</td>
<td></td>
</tr>
<tr>
<td>UDVA - After</td>
<td>0.8</td>
<td>1.0</td>
<td>0.964</td>
<td>0.1</td>
<td>0.0001</td>
</tr>
<tr>
<td>UNVA - Before</td>
<td>0.1</td>
<td>1.0</td>
<td>0.650</td>
<td>0.31</td>
<td></td>
</tr>
<tr>
<td>UNVA - After</td>
<td>0.7</td>
<td>1.0</td>
<td>0.981</td>
<td>0.1</td>
<td>0.0001</td>
</tr>
</tbody>
</table>

Wilcoxon test (Z test)= 7.5, P-value < 0.05 (significant).

Table 3 demonstrate the refraction in spherical before and after surgery, there is difference between refraction after and before surgery (P-value< 0.05) and refraction in spherical is better after surgery. From fig 1 show 97% of patients satisfied after surgery.

Table 3: refraction in spherical equivalent before and after surgery.

<table>
<thead>
<tr>
<th></th>
<th>minimum</th>
<th>maximum</th>
<th>mean</th>
<th>Std. deviation</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refraction Before</td>
<td>-9</td>
<td>4.5</td>
<td>0.186</td>
<td>3.2</td>
<td>0.047</td>
</tr>
<tr>
<td>Refraction After</td>
<td>-0.75</td>
<td>0.75</td>
<td>0.358</td>
<td>0.4</td>
<td></td>
</tr>
</tbody>
</table>

Wilcoxon test (Z test)= 7.5, P-value < 0.05 (significant).

Figure 1: distribution of patient satisfaction.

From table (4) there is a significant association between patients’ satisfaction and absence of glare, also a significant association between the absences of patients’ discomfort with patients’ satisfaction. While no significant association between age and gender with patient satisfaction.

Table 4: association between patient’s satisfaction and age, gender, Patient Discomfort, glare.

<table>
<thead>
<tr>
<th></th>
<th>Patient Satisfaction</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>satisfy</td>
<td>Not satisfy</td>
<td>P-value</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>Count</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>less than 30 years</td>
<td>12</td>
<td>0</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>% within Patient Satisfaction</td>
<td>16.7%</td>
<td>0.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>more than 30</td>
<td>Count</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% within Patient Satisfaction</td>
<td>83.3%</td>
<td>100.0%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gender</th>
<th>Patient Satisfaction</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>Count</td>
<td>55</td>
<td>2</td>
<td>0.6</td>
</tr>
<tr>
<td>% within Patient Satisfaction</td>
<td>76.4%</td>
<td>100.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>Count</td>
<td>17</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

% within Patient Satisfaction | 23.6% | 0.0%
---|---|---
**Patient Satisfaction**
satisfy | Not satisfy | P-value
---|---|---
Glare | Count | 72 | 1 | 0.027
% within Patient Satisfaction | 100.0% | 50.0%
---|---|---
Glare Present | Count | 0 | 1 | 0.0%
% within Patient Satisfaction | 0.0% | 50.0%
---|---|---
**Patient Satisfaction**
satisfy | Not satisfy | P-value
---|---|---
Discomfort Absent | Count | 72 | 1 | 0.027
% within Patient Satisfaction | 100.0% | 50.0%
---|---|---
Discomfort Present | Count | 0 | 1 | 0.0%
% within Patient Satisfaction | 0.0% | 50.0%
---|---|---
Chi-square P-value <0.05 (not significant).

**Discussion**
The use of presbyopia-correcting IOL is considered a significant improvement from the patient's point of view [7, 8]. The recent introduction of the trifocal IOL provides more options during the selection of the appropriate IOL. Comparative studies have demonstrated higher optical independence for all distances of the trifocal in comparison to the multifocal IOLs [9–11]. Many papers showed the better action of the multi and trifocal lens in visual and refractive results [10, 12–14], but as patient satisfaction, there were little studies on outcome of trifocal lens on patients fulfillment, use of sight, besides patients' performance of common daily activities, like reading or driving.

Therefore, this study has appraised these aspects using questionnaire-based assessment as well as the evaluation of visual and refractive outcomes. In this study the mean monocular postoperative UDVA was 0.964 (0.8 – 1) decimal (nearly 0.05 [0.1 – 0.0] logMAR), this confirms the effectiveness of the evaluated lens in restoring far vision after lens removal. In our study, the post-operation results of UDVA were better than other studies [2, 5, 10, 12, 14]. The better visual results in our study were clear with significant variations of symptoms of refraction. Post-operation refraction mean and SD was - 0.35D (- 0.75D - + 0.75D) in spherical equivalent and this was comparable or better than the other studies [5, 10, 12, 14, 17]. In this study, UNVA postoperatively was ranging from 0.7 – 1.0 (mean 0.981 Decimal) nearly 0.02 logMAR with a range from 0.16 to 0.00 logMAR measured at 33 cm.

When comparing our results with other studies our results are significant [5, 12, 14, 17]. Several factors can explain the difference in our results from those reported earlier in terms of different surgical procedures, examination protocols, and patient samples. All reported mean values showed that trifocal IOL is an excellent choice to restore near visual function after lens removal surgery. Outcomes of studies with refractive multifocal IOL has shown less robust results from UNVA may be connected to abnormalities that bound the near vision [18, 19].

Concerning the level of vision unconventionality attained with the embedding of the assessed trifocal lens was better for all patients used electronic tools and patient need to read and watch TV with no uses any glasses which is greater to other kinds of the lens [5,20]. The photic spectacles consist of: glare at day and at night, flash descriptions, auras were described by only one patient (1.4%) which is better than other studies [5, 14, 21]. The excellent visual and refractive outcomes with no dependence on spectacles and the very low level of photic phenomenon achieved in this study have led to greater patient satisfaction. So on a scale of 1 – 10, a mean of 9.3 ± 0.72 was recorded which is comparable to other studies [5, 22]. In conclusion, implantation of the Medicontur trifocal IOL (Liberty) after lens removal surgery restores visual acuity with a minimal level of photic phenomena, better to doing normal everyday actions with no glasses, and with good satisfaction of patients after operation.

**References:**

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