Visual Outcome Improvement of Phacoemulsification in Eyes with Senile Cataract at Ramata Eye Hospital, Denpasar, Bali, Indonesia

Anak Agung Putri Satwika, Ayu Diah Permatasari, I Wayan Gede Jayanegara, Siska Sumanjaya

ABSTRACT

Senile cataract is the leading cause of blindness and visual impairment among cataract patients globally including in Indonesia. Phacoemulsification is a commonly performed procedure to improve visual outcome among senile cataract patients because of its advantages compared to other techniques. This study is aimed to determine visual outcome improvement after phacoemulsification among senile cataract patients. A descriptive study was carried out among senile cataract patients who underwent phacoemulsification procedure at Ramata Eye Hospital, Denpasar, Bali, Indonesia between January 2020-July 2021. A total number of 115 operated eyes were followed-up to obtain their postoperative visual acuity (VA) and complications. Most patients were female and found in age range of 70-79 years. There are significant improvement of VA resulting in the decrease of blind patients to 0.0% and increase in the number of patients with good vision (normal to mild visual impairment) to 85.2% after phacoemulsification procedure. There was also low rate of postoperative complications. Therefore, phacoemulsification procedure should be continually considered and performed as a treatment options in treating senile cataract patients.

Keywords: Ophthalmology, phacoemulsification, senile cataract, visual acuity.

I. INTRODUCTION

Cataract is a pathological condition of cloudy lens due to hydration of lens water or denaturation of lens protein [1]. It is considered as the primary cause of blindness and visual impairment worldwide. According to the World Health Organization (WHO), cataract is responsible for 47.8% of blindness, accounting for 17.7 million blind people [2]. Age related cataract or also known as senile cataract has been the most frequently encountered case resulting in blindness among cataract patients globally. Epidemiologic studies have reported prevalence numbers of 31–41% in populations over the age of 40 years [3]. The Indonesian nationwide prevalence of blindness among people in aged of 50 years and above was 3.0% between 2013-2017, which is the highest among the Southeast Asia region (SEAR) countries. The Indonesian Rapid Assessment of Avoidable Blindness (RAAB) surveys found that cataract was responsible for 81.2% of those cases. Higher volume with better quality cataract surgery services will have an impact on reducing the prevalence of blindness over the country [4].

The only treatment approach for cataract is surgical removal of the lens followed by its replacement with a permanent artificial intraocular lens (IOL) [5]. The primary indication for surgery is the decrease in visual function beyond the patient’s required standard, in which the cataract surgery provides a reasonable likelihood to improve upon [6]. Successful cataract surgery universally improves the patient vision and quality of life [5]. The emerging cataract surgery with phacoemulsification technique allows lens extraction with smaller incision. It also does not require stitches, which results in faster healing process [7]. The visual outcome of the cataract surgery is dependent on variety of preoperative factors such as selection of patients, visual potential, technique of cataract surgery, intraoperative complications, and postoperative care. This study aims to determine visual outcome improvement among senile cataract patient who had received their phacoemulsification procedure at Ramata Eye Hospital, Denpasar, Bali, Indonesia.

II. METHODS

This is a descriptive study with purposive sampling method involving senile cataract patients who underwent phacoemulsification at Ramata Eye Hospital Denpasar Bali Indonesia in January 2020 – July 2021. The data were...
collected retrospectively from medical record of patients aged 40 years old and above, whom diagnosed with senile cataract based on their medical history, uncorrected visual acuity, as well as slit lamp and fundoscopy examination. The patients also had preoperative examinations, i.e., biometry optic (IOLMaster 500, Zeiss, Germany), retinometry (Retinometer, Heine, Germany), specular (Specular, Topcon, Germany), prior to the surgery. The patients with pre-existing ocular comorbidities (glaucoma, diabetic retinopathy, artery/vein occlusion), other types of cataracts (traumatic cataract, congenital cataract, metabolic cataract, complicated cataract), ocular surgical history, and loss to follow-up are excluded.

All patients had phacoemulsification under local anesthesia performed by two different operators but using the same technique and postoperative medications. Phacoemulsification procedure was carried out using the direct chop technique. The data of the senile cataract staging and eye involved were collected. The uncorrected visual acuity (UCVA) before phacoemulsification, one day, seven days, and four weeks after the surgery were assessed in this study. The data of best corrected visual acuity (BCVA) after surgery was also collected. Postoperative complications were followed-up up to one month after surgery.

The data were collected and analyzed by using Microsoft® Excel 2019 to determine characteristics of the patients, i.e., frequency of the senile cataract patients, who underwent phacoemulsification procedure and gained visual acuity improvement. VA outcomes are categorized using WHO’s standard category for visual impairment and blindness, which are normal to mild visual impairment (6/6 - ≥ 6/18), moderate visual impairment (6/18 - ≥ 6/60), severe visual impairment (6/60 - ≥3/60) and blindness (<3/60). The data are presented in the form of tables and graph.

III. RESULTS

The total number of patients fulfilled the inclusion criteria and enrolled for this study were 115, consisting of 49 males (42.6%) and 66 females (57.4%). Their median age was 69 years and most of the senile cataract patients in this study were found in the age range of 70-79 years. The characteristics of the patients are summarized in Table I.

Based on the senile cataract staging, most of them were still in immature (83.5%) rather than the mature stage (15.5%). Sixty-two (53.9%) cataract cases were found on the right eye and 53 (46.1%) cases were found on the left eye. Table II presents the characteristics of senile cataract among the patients who underwent phacoemulsification procedure.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Total (N=115)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>66</td>
<td>57.4</td>
</tr>
<tr>
<td>Male</td>
<td>49</td>
<td>42.6</td>
</tr>
<tr>
<td>Age (Year)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40-49</td>
<td>2</td>
<td>1.7</td>
</tr>
<tr>
<td>50-59</td>
<td>18</td>
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<td>60-69</td>
<td>40</td>
<td>34.8</td>
</tr>
<tr>
<td>70-79</td>
<td>45</td>
<td>39.1</td>
</tr>
<tr>
<td>≥ 80</td>
<td>10</td>
<td>8.7</td>
</tr>
</tbody>
</table>

TABLE II: SENILE CATARACT CHARACTERISTICS

Based on the preoperative examination of VA classified based on WHO’s standard category for visual impairment, 53 (46.1%) patients were classified as blind with VA less than 3/60. A total of 18 (15.7%) patients had severe visual impairment with VA ranging from 6/60 to 3/60. Moderate VA was found in 36 (31.3%) patients with VA range of 6/60-6/18. There were only 8 (6.9%) patients having mild visual impairment with VA better than 6/18. After phacoemulsification procedure, UCVA patients were followed up especially in the first day, seventh day, and thirtieth day after the surgery. Following the phacoemulsification procedure, the VA of the patients were improved in most of the cases. Table III shows the comparison of VA before and after phacoemulsification procedure among patients in this study. It shows phacoemulsification and IOL implantation reduced the number of patients who were previously categorized as blind from 46.1% to 0.0%. On the other hand, this procedure also improved the number of patients to have a normal/mild visual impairment from 6.9% to 85.2%.

Among 115 eyes who underwent phacoemulsification, VA assessment on the first day showed 51 (44.3%) eyes had normal to mild visual impairment, 31 (27%) eyes had moderate visual impairment, 10 (8.7%) eyes had severe visual impairment, and 23 (20%) eyes still blind. On the seventh day of postoperative, the number of eyes with normal to mild visual impairment increased to 85 (73.9%), eyes with moderate visual impairment reduced to 26 (22.6%), only 4 (3.5%) eyes still had severe visual impairment, and there was none categorized as blind eye. On the thirtieth day, the total number of eyes considered to have normal to mild visual impairment increased to 97 (84.3%), 18 (15.2%) eyes categorized as moderate visual impairment, and no eyes fell under category of severe visual impairment or blindness. Fig. 1 shows VA improvement before phacoemulsification, day 1, day 7 and day 30 after phacoemulsification. Thirty day after surgery, correction of refractive error was done in the patients who still had visual impairment. Among all the patients, 109 patients (94.8%) could gain their BCVA, which categorized as normal or mild visual impairment. Only 6 (5.2%) patients remained categorized as moderate visual impairment in their BCVA.

Postoperative complications after phacoemulsification were also followed-up in this study. In the first day after phacoemulsification, there were corneal edema found in 26 patients (22.6%) as early complications. Late postoperative complication in this study after a month of surgery, there were posterior cataract opacification (PCO) in 3 (2.5%) patients. Meanwhile, the remaining of the 112 (97.4%) patients had no complications up to a month after the surgery.
IV. DISCUSSION

This is a descriptive observational study associated with VA improvement after phacoemulsification procedure in senile cataract patients at Ramata Eye Hospital, Bali, Indonesia. The number of senile cataracts in this study was proportionately higher in females (57.4%) compared to males (42.6%) with the age range between 70-79 years old (39.1%) and most of the eyes were operated in immature cataract stage. In previously reported studies conducted in China senile cataract is more frequently encountered in female than male patients with age majority above 60 years old [8], [9]. Study of senile cataract in Sweden, also found that prevalence cataract in female is higher than in male with dominant age between 70-74 years old (45.9%) [10]. It has been suggested that women have a higher incidence and risk for most types of cataracts than men potentially due to lack of estrogen in post-menopausal years [3], [11]. However, there are other risk factors that also play a role in the occurrence of senile cataract such as lifestyle-related factors, UVB exposure, and oxidative stress.

Phacoemulsification is one of the procedure options for cataract patient, which is highly effective and efficient. Phacoemulsification has many advantages because this procedure requires only a small incision, which can control the anterior chamber to keep intraocular pressure within normal limits and prevent expulsive or suprachoroidal hemorrhage. This small incision also has a lower risk of developing astigmatism, so it also enables more rapid improvement on the patient vision compared to the large incision. Smaller incisions require less sutures, or even without sutures and require less rehabilitation time than larger incisions [12]. Based on the collected data, improvement of VA was found in senile cataract patient before and after phacoemulsification and IOL implantation procedure. There were 46.1% patient, who categorized as blind before the procedure, successfully attained 0.0% blindness after procedure, while the remaining 84.3% of the patients has normal or just categorized as mild VA impairment without correction. Previous study in Pakistan, Thailand, Nigeria, and India also observe the significant improvement on the visual outcome after phacoemulsification surgery. In Pakistan, from 842 operated eyes, initially 2% had good of 6/6 - 6/18, around 12% had satisfactory VA of 6/24 - 6/60, and more than 80% had poor VA of <6/60. After the surgery, number of eyes with good VA increase to 39%, while the eyes exhibit poor VA decrease to 20% [7]. These figures further improve with correction using spectacles to 80.5% and 8.1% for good and poor VA, respectively. In Thailand, similar study also observes the improvement of the VA post phacoemulsification surgery, whereby VA of less than 6/60 are reduced from 36.15% to 2.28%, while VA of >6/18 from only 2.36% to 83.6% in a month after surgery [13]. In Nigeria, phacoemulsification procedure was able to reduce the number of eyes with VA of <6/60 from 35.7% to 4.5% and increases eyes with VA of >6/18 from 38.2% to 85.4%. Moreover, based on BCVA, 94.7% of eyes had BCVA of 6/12 or better 3 months after the surgery [1]. Another study in India, also shows 58.1% improvement on total eyes with good VA of 6/6-6/18, and further improvement of 29.9% upon correction 4 weeks after the surgery [14]. Meanwhile in our study, there was no patients that still had severe visual impairment and blindness after a month of phacoemulsification.

The BCVA data of the patients were also collected in this study. From the total number of patients, 94.8% patients could get their BCVA under category of normal to mild visual impairment, while 5.2% patients still had moderate visual impairment in their BCVA. We suggest several factors that can potentially have an impact on these findings, i.e., complications like PCO occurred to several patients and systemic condition like hypertension, which can develop to hypertensive retinopathy and decrease in VA.

In this study, corneal edema found as early postoperative complications within first day until seventh day after surgery. This condition usually got better within a week of observation. Late postoperative complication was also found as PCO. Opacity is the result of lens epithelial cells migration to the posterior capsule, leading to decrease in VA, and its sensitivity [15]. In a study conducted in Thailand, corneal edema (1.35%) and PCO (20.44%) are found as early and late complication after phacoemulsification procedure, respectively [13]. Nd:YAG laser capsulotomy procedure was performed to treat patients with PCO in this study to restore

TABLE III: VISUAL ACUITY AMONG THE PATIENTS BEFORE AND AFTER PHACOEMULSIFICATION

<table>
<thead>
<tr>
<th>Visual Impairment Category</th>
<th>Before Phacoemulsification</th>
<th>After Phacoemulsification (N=115)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Day 1</td>
<td>Day 7</td>
</tr>
<tr>
<td>Normal to mild (6/6-6/18)</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Moderate (6/18-6/60)</td>
<td>8.9%</td>
<td>51 (43.3%)</td>
</tr>
<tr>
<td>Severe (6/60-3/60)</td>
<td>18 (15.3%)</td>
<td>10 (8.7%)</td>
</tr>
<tr>
<td>Blind (&gt;3/60)</td>
<td>53 (46.1%)</td>
<td>23 (20%)</td>
</tr>
</tbody>
</table>

Fig 1. Visual acuity improvement in senile cataract patients who underwent phacoemulsification.
their VA. Nd:YAG laser capsulotomy is the standard treatment for PCO and is generally found to be the safer option and more effective [16].

The limitation of our study is the phacoemulsification procedures were conducted by two different surgeons. Even though they implemented the same technique, they have varying skills and expertise. These factors can influence the outcome of surgery. Compared to other studies, our study uses a smaller sample size and limited postoperative follow up time to observe the visual outcomes. A larger number of samples and longer observation time are recommended to obtain more optimum set of results, thus allowing more proper treatment to be implemented on the complications occur after phacoemulsification in senile cataract patients.

V. CONCLUSION

The visual outcome results after phacoemulsification at Ramata Eye Hospital, Denpasar, Bali, Indonesia showed significant improvement of VA and successfully decreased the percentage of severe visual impairment and blindness among senile cataract patients. Furthermore, it also offers low rate of postoperative complications. Thus, phacoemulsification procedure should be continually considered and performed as a treatment options in treating senile cataract patients.

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CONFLICT OF INTEREST

Authors declare that they do not have any conflict of interest.

REFERENCES


