Ophthalmol Ina 2023;Supplement Ed.: 355-365

LITERATURE REVIEW

MONOVISION VERSUS MULTIFOCAL INTRAOCULAR LENS IMPLANTATION IN CATARACT PATIENTS: A SYSTEMATIC REVIEW AND META-ANALYSIS

Fadhli Waznan[1], Yosilia Nursakina[2], Aydan J. Rancakbudi[3] Syska Widyawati[1]
[1]RSUPN Dr. Cipto Mangunkusumo, Jakarta, Indonesia
[2]School of Public Health, Imperial College London, SW7 2BX London, UK
[3]Faculty of Medicine, Universitas Indonesia, Jakarta, Indonesia
Email: fwaznan@gmail.com

ABSTRACT

Introduction: *With the aim to increase spectacle independence, recent approaches to repair cataracts include the implantation of premium intraocular lenses (IOLs), such as multifocals. Another approach is monovision techniques achieved by monofocal IOL implantation, which is more cost-effective, although it has the same good outcome as multifocal IOLs. This meta-analysis aimed to compare monovision versus multifocal IOL implantation in cataract patients.*

Method: *Systematic search was performed in April 2023 on six databases (Medline, SCOPUS, ProQuest, EBSCO, Embase, and PubMed). Studies were extracted for the following outcome of interest: monovision, multifocal intraocular lens, spectacles independence, visual acuity. All studies published up to April 2023 were reviewed. Cochrane risk of bias tool (RoB 2) and The Risk of Bias in Non-randomized Studies – of Interventions (ROBINS-I) was used to screen studies for risk of bias where appropriate. A meta-analysis was done to quantify any reported quantitative data.*

Result: *Ten studies satisfying the inclusion criteria were included. Pooling analysis for BCVA and BNVA showed no difference between monovision vs multifocal IOL (95% CI at -0,10 to 0,73; I^2=79% [p=0,14] and 95% CI at -0,27 to 1,37; I^2=94% [p=0,19], respectively). Spectacle independence showed monovision was inferior to multifocal IOL (RR 0,53; 95% CI at 0,34 to 0,82; I^2 83% [p=0,004]).*

Conclusion: *Current evidence showed monovision was comparable to multifocal IOL in terms of visual acuity. While multifocal IOL achieved more spectacle-free patients than monovision, many patients in the monovision group also achieved spectacle-free condition.*

Keywords: *cataract, monovision, multifocal intraocular lens, visual acuity, spectacle independence.*

INTRODUCTION

In 2019, cataract was the top cause of blindness worldwide, affecting 1,208 out of every 100,000 people on a global scale.[1] The highest prevalence is in lower-middle income regions, i.e., South-East Asia, especially Indonesia. By contrast, America and the European region had the lowest prevalence in the past 20 years, which shows that socio-economic disparity still exists in diagnosing and treating cataracts worldwide.[2] According to reports, cataracts caused 55% of blindness among adults aged 50 in 2015.[3] As the elderly population grows to 1.4 billion by 2030, the risk of vision loss will also substantially increase.[4] This upcoming challenge made

it crucial to enhance the availability of affordable and effective cataract surgery, particularly in developing nations.

Modern cataract surgery involves replacing the crystalline lens with an artificial intraocular lens (IOL). Although cataract surgery has improved, correcting the loss of accommodation after the operation is still challenging. Different methods exist to correct induced presbyopia, including premium IOLs (accommodating or multifocal lenses) and pseudophakic monovision techniques achieved through monofocal IOL implantation.[5] The goal is to correct presbyopia and eliminate the need for glasses while maintaining visual function and performance.[6]

Studies have shown that multifocal IOLs can provide good results for both near and distant vision, making patients less dependent on glasses.[7,8] However, these IOLs are not widely used due to their higher cost and potential visual side effects.[9] Some side effects include dysphotopsia, decreased contrast sensitivity, and visual disturbances at night, which can cause discomfort and affect patient satisfaction.[10]

Pseudophakic monovision is a technique where one eye (usually the dominant one) is corrected for distance vision while the other is corrected for near vision. This technique is commonly used for those with presbyopia and is associated with high satisfaction rates. It is an affordable and accessible option for improving near vision after cataract surgery. Studies have shown that pseudophakic monovision is well-accepted and effective.[11,12]

Recent studies have shown no statistically significant differences in visual acuity and spectacle independence between multifocal IOLs and monovision. In contrast, multifocal IOLs patients had more side effects, i.e., more glare/halos and worse contrast sensitivity, than patients receiving monofocal IOLs.[13] In addition, multifocal intraocular lenses are costly and seldom covered by insurance, while monovision with monofocal lenses is more affordable and often insured, especially in low- and middle-income countries.[14] Whether multifocal IOLs were superior to monovision regarding visual outcomes and side effects remained contentious.

We conducted a systematic review and meta-analysis to compare the visual outcomes of patients who received multifocal IOLs to those who received monovision by monofocal IOLs after cataract surgery. The critical questions for this review were (1) What is the rate of spectacle independence of monovision compared to multifocal lenses; (2) How is the post-operative visual acuity in terms of distance and near vision; and (3) How is the contrast sensitivity and occurrence of glare between both lenses?

METHODS

This article is based on previously conducted studies. Literature search, study selection, quality assessment, and data extraction were performed by three independent investigators. Agreement was assessed after each step, and disagreements were resolved through discussion. The review process is described in detail in Figure 1.

Search Strategy

We conducted a systematic literature search in several databases (EBSCOhost, Embase, Ovid MEDLINE, ProQuest, PubMed, and Scopus) to identify articles published from any country comparing the use of monovision and multifocal IOLs. We used "cataract surgery", "multifocal", and "monovision" terms accordingly. We identified and deleted duplicated articles with the assistance of Covidence.

Selection Criteria

We reviewed all papers directly comparing efficacy of monovision to multifocal IOLs in patients with bilateral cataract surgery. Studies published by April 07, 2023 (last search update) in English were considered if available in full text. Only published data were used in this review.

Types of Outcomes

Primary outcome was proportion of patients with complete post-procedural spectacle independence. Secondary outcomes were (i) post-procedural binocular uncorrected near and distance visual acuity; (ii) contrast sensitivity; and (iii) incidence of halos among patients.

Data Extraction

Data were extracted at the point of longest follow-up; spectacle independence and incidence of halos as n/N using all patients who received the assigned treatment as a denominator; visual acuity and contrast sensitivity as continuous data (mean ± SD). Data on detailed type of interventions, follow-up time, and methods of outcome assessment were also collected.

Assessment of Risk of Bias (Study Quality)

To assess the risk of bias for randomized clinical trials (RCTs), the version 2 of the Cochrane risk-of-bias tool for randomized trials (RoB 2) was used. This tool included five specific bias domains: randomization; deviation from intended intervention; missing data; outcome measurement; and selection of reported results.[15] To evaluate the risk of bias in Non-Randomized studies of interventions (observational studies), the The Risk Of Bias In Non-randomized Studies – of Interventions (ROBINS-I) tool was used, which considered seven domains: confounding, selection of participants, classification of interventions, deviations from

intended interventions, missing data, measurement of outcomes, and selection of the reported result.[16]

Data Synthesis and Statistical Analysis

For all the desired outcomes, forest plot Review Manager (RevMan 5,4) were used. A random effects model was used for all analyses, considering the significant heterogeneity of data. Only variables that were reported by at least two included studies underwent meta-analysis. To assess the heterogeneity, we used the I^2 statistics test with a cut-off of 25%, 50%, and 75% as low, intermediate, and high risk of bias, accordingly. Significance was set at the level of P-value less than 0,05.

RESULTS

Study Eligibility and Characteristics

Study selection is depicted in Figure 1. A total of 13 potentially relevant studies comparing treatments were identified and evaluated. Of those, one was excluded because no desired outcomes were assessed, and two were excluded because no full text was available. All remaining ten studies were direct comparisons of monovision to multifocal.

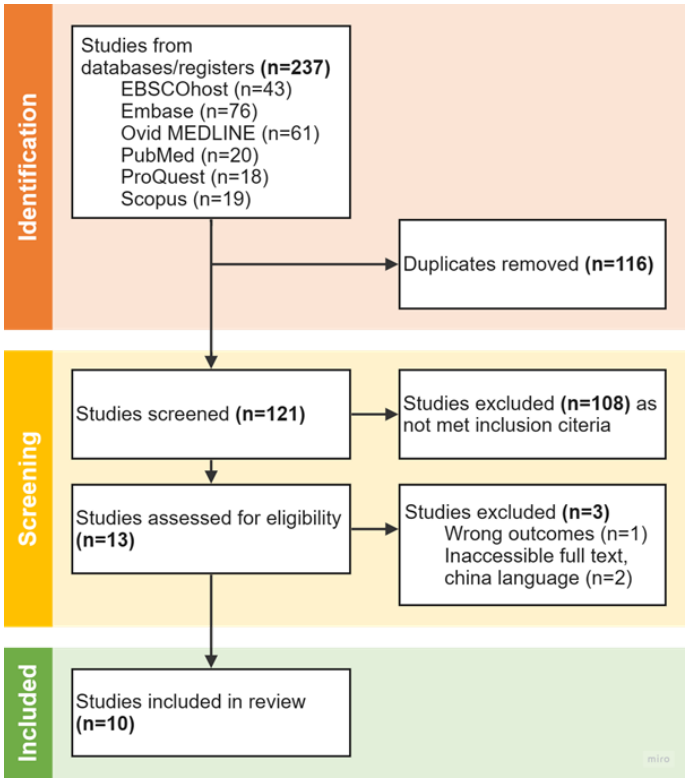

Figure 1. Search Process.

Risk of Bias (Study Quality)

Both randomized clinical trial studies have low risk of bias. Both trials reported data on spectacle independence, binocular uncorrected visual acuity, and contrast sensitivity.

Table 1. Risk of bias assessment of included RCT studies.[11,17] D1 means bias arising from the randomization process. D2 means bias due to deviations from intended intervention. D3 means bias due to missing outcome data. D4 means bias in measurement of the outcome. D5 means bias in selection of the reported result. The plus symbol (+) means low risk of bias, minus (–) means some concerns of bias, while cross (×) means high risk of bias.

Study	RCT Studies Risk of Bias Domains					
	D1	D2	D3	D4	D5	Overall
Labiris 2015	+	+	+	+	+	+
Wilkins 2013	+	+	+	+	+	+

Half of observational studies have shown some concerns of bias in various domains. There is no indication of high risk of bias in any domain within this group of study.

Table 2. Risk of bias assessment of included non-RCT studies.[7,12,18–23] D1 means bias due to confounding. D2 means bias due to selection of participants. D3 means bias in classification of interventions. D4 means bias due to deviations from intended interventions. D5 means bias due to missing data. D6 means bias in measurement of outcomes. D7 means bias in selection of the reported result. The plus symbol (+) means low risk of bias, minus (–) means some concerns of bias, while cross (×) means high risk of bias.

Study	Non-RCT Studies Risk of Bias Domains							
	D1	D2	D3	D4	D5	D6	D7	Overall
Chen 2007	+	–	+	+	–	+	+	–
Chen 2010	+	+	+	+	+	–	+	–
Ito 2009	+	+	+	+	+	+	+	+
Labiris 2022	+	+	+	+	+	+	+	+
Rodov 2019	+	+	+	+	+	–	–	–
Stock 2017	+	+	–	+	+	+	+	+
Zhang 2011(1)	+	+	+	+	+	+	+	+
Zhang 2011(2)	+	+	+	+	+	+	+	+

Method of Examinations

All existing studies have indications for bilateral cataract surgery over the age of 40 years. In the monovision group with monofocal IOLs, various brands of lenses were used (Acrysof IOLs in 6 studies, Alcon SN60WF IOLs in 2 studies, Canon-Staar AQ110NV IOLs in 1 study, and Akreos AO IOLs in 1 study). In multifocal, the lenses' type also varied. Monovision was achieved by targeting the non-dominant eye between -0.5 D to -1.25 D in 5 studies and between -1.0 D to -2.0 D in 5 studies. Follow-up time ranges from 1 to 12 months.

In conducting the pooling analysis, we only use data with the most uniform outcome assessment methods and the most frequently used standard units (numeric/categorical) between studies. The results obtained were a pooling of 6 studies on spectacle independence, 5 studies on visual acuity, 3 studies on contrast sensitivity, and 4 studies on presence of glare.

Study (ref.)	Indication and patients	Treatments (manufacturer); *N* treated	Evaluation time	Spectacle independence	Visual acuity	Contrast sensitivity	Presence of glare
Chen 2007	Underwent bilateral uncomplicated cataract surgery; 40 patients at 50—80 years old	Monovision: Acrysof IOL (between plano to -0.50 spherical equivalent in dominant eye and -0.5 to -1.25 in non-dominant eye) (N=20) vs. Multifocal: Array IOLs (N=20)	12 months	Yes/No question	Ability to read Snellen chart at 20/30 and Jaeger chart at J3 in categorical data	Not examined	Not examined
Chen 2010	Underwent bilateral uncomplicated cataract surgery; 40 patients at 50—80 years old	Monovision: Acrysof SN60WF IOLs (between plano to -0.05 spherical equivalent in the dominant eye and -0.50 to -1.25 in the non-dominant eye) (N=20) vs. Multifocal: ReSTOR SN60D3 IOLs (N=20)	3 months	Yes/No question	Ability to read Snellen chart at 20/30 and Jaeger chart at J3 in categorical data	Not examined	Not examined
Ito 2009	Underwent bilateral cataract surgery; 60 patients	Monovision: Canon-Staar AQ110NV IOLs (between plano and +0.25 D in the dominant eye and -1.00±0.50 D in the non-dominant eye) (N=38) vs. Multifocal: Array SA40N IOLs (N=22)	12 months	Not explained how examined	MNREAD-J chart (logMAR)	Not examined	Not examined
Labiris 2015	Senile cataract with grade 2 nuclear opalescence LOCS 3 grading scale between January and July 2013; 75 patients	Monovision: Alcon Laboratories Inc. SN60WF hydrophilic acrylic IOLs (-0.50 D in the dominant eye and -1.25 D in the nondominant eye) (N=38) vs. Multifocal: aspheric multifocal IOL (Isert PY60MV, Hoya Surgical Optics, Inc.) in both eyes (N=37)	6 months	Likert-type questions	Distance: ETDRSC at 4 meters Near: not explained how examined	Pelli-Robson test at 85cd/m² background light	Likert-type questions in numerical data
Labiris 2022	Senile cataract with stage 2 nuclear opalescence LOCS-3 grading scale; 120 patients	Monovision: Alcon SN60WF IOLs (-0.50 D in the dominant eye and -1.25 D in the non-dominant eye) (N=30) vs. Multifocal: Panoptix IOLs (N=30)	6 months	Likert-type questions	ETDRS, DDART	Pelli-Robson test at 85cd/m² background light	Likert-type questions in numerical data
Rodov 2019	Bilateral age-related cataract surgery with implantation of the same type of IOL in both eyes	Monovision: Acrysof SN60WF/SA60AT IOLs with one eye for near vision (between -1.50 and -2.00 D) (N=50) vs. Multifocal: FineVision Micro F/POD F (PhysIOL Inc., Liège, Belgium) (N=50)	1 month	Likert-type questions	Distance: Not explained how examined Near: Not explained how examined	Not examined	Likert-type questions
Stock 2017	Cataract surgery with bilateral implantation in September 2013 to March 2015.	Monovision: AcrySof IQ SN60WF aspheric monofocal IOLs (N=29) vs. Multifocal: AcrySof ReSTOR SN6AD1 diffractive aspheric multifocal IOLs (N=32)	8 months	No specific overall spectacle independence outcome.	Not examined	Not examined	Degree of difficulty in night vision and the presence dysphotopsia
Wilkins 2013	Bilateral cataract and no significant co-pathology between April 2007, and August 2010; 211 patients.	Monovision: Akreos AO IOL (Bausch & Lomb, Rochester, NY) with emmetropia in the “distance” and the “near” eye power targeting myopia between -1.00 and -1.50 D (N=93) vs. Multifocal: Tecnis ZM900 IOL (Abbott Medical Optics) targeting emmetropia (N=94)	4 months	No specific overall spectacle independence outcome.	Visual acuity at 4 m, 1 m, and 40 cm using ETDRS logMAR charts	Pellie-Robson contrast sensitivity	Likert-type questions
Zhang 2011 (1)	Bilateral cataract surgery patients from July 2007 to June 2009 who desired spectacle independence	Monovision: AcrySof SN60WF IOLs with full monovision (approximately 2.00 D difference between the dominant eye and the nondominant eye) (N=22) vs Multifocal: AcrySof ReSTOR SN60D3 IOLs (N=21)	3 months	No specific overall spectacle independence outcome.	Snellen chart in categorical data	Not examined	Likert-type questions
Zhang 2011 (2)	Bilateral cataract surgery patients from July 2007 to June 2009 who desired spectacle independence	Monovision: AcrySof SN60WF IOLs with full monovision (approximately 2.00 D difference between the dominant eye and the nondominant eye) (N=22) Multifocal: AcrySof ReSTOR SN60D3 IOLs (N=21)	3 months	No specific overall spectacle independence outcome.	Snellen chart in categorical data	Not examined	Not examined

Figure 2. Methods of all studies used.

Spectacle Independence

A total of six trials were included in pooling analysis, with a total of 502 patients undergoing bilateral cataract surgery. Incidence of spectacle independence was considerably lower for monovision vs. multifocal IOL (Fig. 3), with relative risk (RR) of 0,53 (95% CI at 0,34 to 0,82; I^2 83% [p=0,004]).

Ophthalmol Ina 2023;Supplement Ed.: 355-365

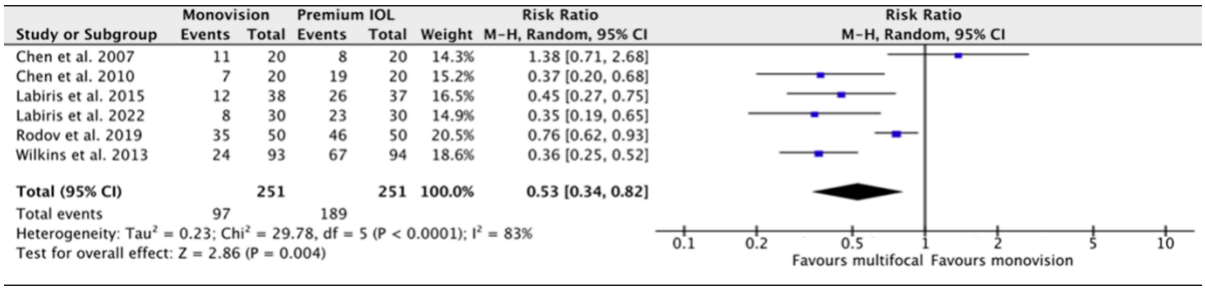

Figure 3. Forest plot of comparison: spectacle independence.

Uncorrected Binocular Visual Acuity

Uncorrected binocular visual acuity was evaluated through both uncorrected distance visual acuity (UDVA) and uncorrected near visual acuity (UNVA). Five trials evaluating 481 patients' UDVA showed no difference between two groups (Fig. 4) (95% CI at -0,10 to 0,73; I² 79% [p=0,14]). The same five trials also evaluated patients' UNVA (Fig. 5), which showed no statistically significant difference (95% CI at -0,27 to 1,37; I² 94% [p=0,19]).

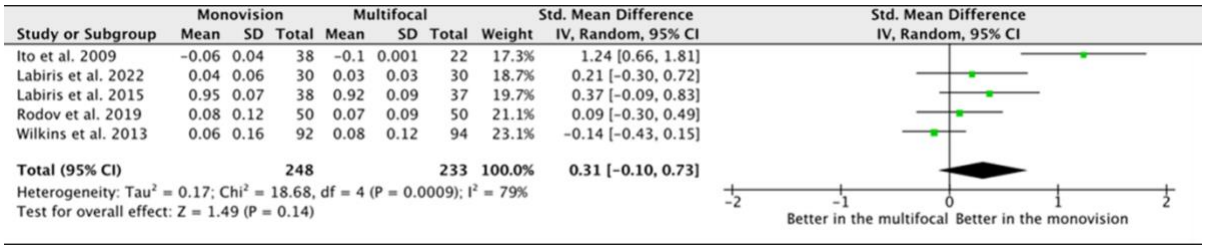

Figure 4. Forest plot of comparison: uncorrected distance visual acuity.

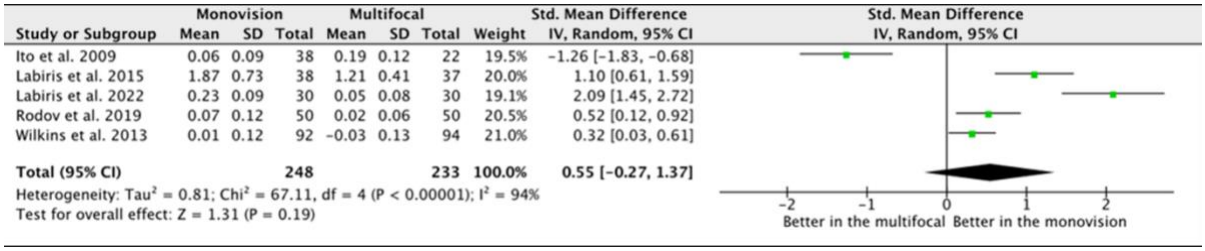

Figure 5. Forest plot of comparison: uncorrected near visual acuity.

Contrast Sensitivity

Three trials evaluating 322 patients' contrast sensitivity through Pelli-Robson test showed no difference between two groups (Fig. 6) (95% CI at -0,05 to 0,68; I² 58% [p=0,09]).

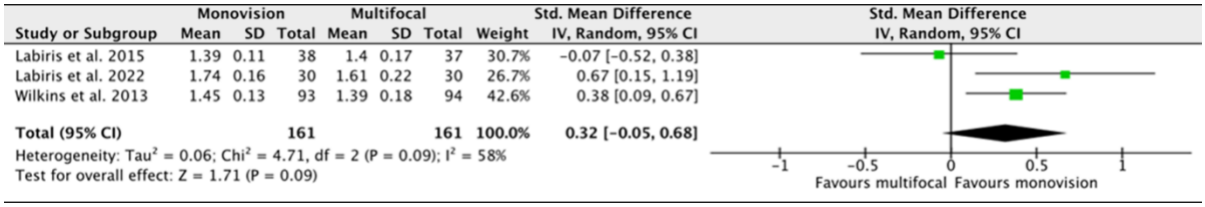

Figure 6. Forest plot of comparison: contrast sensitivity.

Presence of Glare

Four trials, which included 391 patients, evaluated the presence of glare after the intervention. Presence of glare was lower for the monovision group (Fig. 7) with a relative risk of 2,00 (95% CI at 1,26 to 3,18; I^2 64% [p=0,003]).

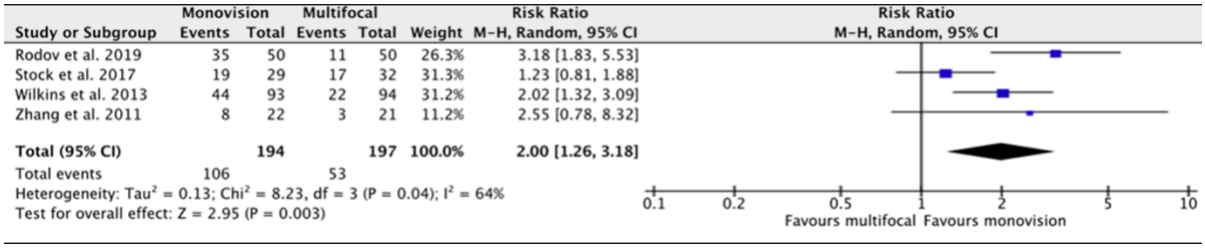

Figure 7. Forest plot of comparison: presence of glare.

DISCUSSION

A comprehensive literature search based on a sensitive strategy is unlikely to have missed any relevant study regarding direct comparison of monovision and multifocal IOL. Although all studies did not find a high risk of bias, this meta-analysis has several drawbacks. Differences in the target power of the non-dominant eye in the monovision group can affect the patient's comfort level, with higher power being more difficult to tolerate. The different types of multifocal IOL used also affect the outcome, with each type of multifocal lens having different advantages. In addition, differences in studies between RCTs and non-RCTs certainly provide results of varying quality, although there is no risk of bias that is feared to affect the overall analysis. Despite the various shortcomings, this study can provide a new picture of how monovision compares to multifocal IOL on important aspects to consider for patients undergoing bilateral cataract surgery.

Spectacle Independence

This review suggests that despite the heterogeneity and different testing methodology (yes-or-no questions, Likert-type questions), the results almost consistently favor the multifocal group. One exception was Chen's finding in 2007. He himself then stated in his newer 2010 finding that his previous data might have been biased considerably as patients who had access to multifocal IOL tend to be more determined to be spectacle independent, and thus higher standard to what is considered to be 'independent'.[20] Recipients of the blended monovision IOL benefit from apparent accommodation, or pseudo accommodation. While one eye has the ability to see distant vision, the other eye is focused to see near vision. Some patients may not tolerate the fusion process of both eyes. This could be due to the difference in lens power being too

large. The overall result is consistent with previous literature, which stated that multifocal IOL, despite its economical drawback, is more consistent in reaching spectacle independence.[8]

Uncorrected Binocular Visual Acuity

This review did not find any significant difference in visual acuity. Although there were varying interventions (eg. IOLs with different power, types, and operator) and methods of measurement (eg. Snellen chart, Jaeger chart, ETDRS, etc.) used in reviewed studies, this was in line with most studies showing similar results. Both monovision and multifocal IOLs presented excellent outcomes in distance and near vision. Some studies do consider visual acuity to be the strength of monovision method compared to monofocal IOLs, but not by far enough to affect spectacle independence compared to multifocal IOLs, which is often the aim of IOL implantation.[11,18,20,21]

Contrast Sensitivity

Post-surgical cataract patients experienced similar contrast sensitivity with monovision using a monofocal IOL compared to a multifocal IOL. In this review, the three studies used the same testing method, the Pelli-Robson test, so there is no variation in equipment or testing conditions for measuring contrast sensitivity. The Pelli-Robson test measures contrast sensitivity using large letters and varying contrast. A score of 2.0 indicates normal vision, while lower scores indicate impairment. However, this test may not accurately assess object recognition beyond chart letters' sizes.[24] The finding in this study is aligned with other studies, which indicates that both IOLs are not superior to each other.[25]

Previous research indicates that monofocal IOLs typically provide superior contrast sensitivity in various lighting conditions compared to multifocal lenses, typically diffractive MF-IOLs, while in refractive MF-IOLs, showed no difference.[11,26,27] Patients with pre-existing night vision issues or those with night-time work or driving responsibilities may experience reduced contrast sensitivity and increased glare/halos following the procedure, which makes informing said patients about the possible side effects essential.

Presence of Glare

The presence of glare was clearly more common or more pronounced with multifocal IOL users than with monovision, similar to findings from other studies.[25] Multifocal IOLs are believed to cause increased intraocular scattered light that can result in glare. Diffractive multifocal IOLs contain zones or steps on their front surface that distribute light to different focal points, dividing it between far and near vision. These steps are responsible for the occurrence of halos and glares.[28] Furthermore, since glare is a subjective symptom, a validated

questionnaire and standardized tool (i.e., wavefront analysis) are recommended to ensure uniformity in reporting glare in studies.[17,25]

CONCLUSIONS

The monovision method with monofocal IOLs could achieve excellent outcomes as in the multifocal group in patients with cataract surgery. It can be a good alternative for those patients who cannot afford multifocal IOL and yet desire some degree of freedom from glasses. However, the multifocal IOL had a significantly higher percentage of spectacle independence compared to the monovision group.

REFERENCES

1. Institute for Health Metrics and Evaluation. Global Burden of Disease Collaborative Network. Global Burden of Disease Study 2019 (GBD 2019) results [Internet]. 2020 [cited 2023 May 13]. Available from: http://ghdx.healthdata.org/gbd-results-tool
2. Shu Y, Shao Y, Zhou Q, Lu L, Wang Z, Zhang L, et al. Changing Trends in the Disease Burden of Cataract and Forecasted Trends in China and Globally from 1990 to 2030. Clin Epidemiol [Internet]. 2023 May;Volume 15:525–34. Available from: https://www.dovepress.com/changing-trends-in-the-disease-burden-of-cataract-and-forecasted-trend-peer-reviewed-fulltext-article-CLEP
3. Flaxman SR, Bourne RRA, Resnikoff S, Ackland P, Braithwaite T, Cicinelli M V, et al. Global causes of blindness and distance vision impairment 1990–2020: a systematic review and meta-analysis. Lancet Glob Heal [Internet]. 2017 Dec;5(12):e1221–34. Available from: https://linkinghub.elsevier.com/retrieve/pii/S2214109X17303935
4. Bourne RRA, Flaxman SR, Braithwaite T, Cicinelli M V, Das A, Jonas JB, et al. Magnitude, temporal trends, and projections of the global prevalence of blindness and distance and near vision impairment: a systematic review and meta-analysis. Lancet Glob Heal [Internet]. 2017 Sep;5(9):e888–97. Available from: https://linkinghub.elsevier.com/retrieve/pii/S2214109X17302930
5. Chang JSM, Chen IN, Chan WM, Ng JCM, Chan VKC, Law AKP. Initial evaluation of a femtosecond laser system in cataract surgery. J Cataract Refract Surg [Internet]. 2014 Jan;40(1):29–36. Available from: https://journals.lww.com/02158034-201401000-00006
6. Labiris G, Gatzioufas Z, Giarmoukakis A, Sideroudi H, Kozobolis V. Liquefaction versus torsional IP: a comparative study on endothelial cells, corneal edema and corneal sensitivity. Ophthalmic Res. 2013;49:37–42.
7. Zhang F, Sugar A, Jacobsen G, Collins M. Visual function and spectacle independence after cataract surgery: Bilateral diffractive multifocal intraocular lenses versus monovision pseudophakia. J Cataract Refract Surg [Internet]. 2011 May;37(5):853–8. Available from: https://journals.lww.com/02158034-201105000-00010
8. Alfonso JF, Fernández-Vega L, Puchades C, Montés-Micó R. Intermediate visual function with different multifocal intraocular lens models. J Cataract Refract Surg [Internet]. 2010 May;36(5):733–9. Available from: https://journals.lww.com/02158034-201005000-00005
9. Barisic A, Dekaris I, Gabric N, Bohac M, Romac I, Mravicic I, et al. Comparison of diffractive and refractive multifocal intraocular lenses in presbyopia treatment. Coll Antropol [Internet]. 2008;32(2):27–31. Available from: http://hrcak.srce.hr/file/54732
10. de Vries NE, Webers CAB, Touwslager WRH, Bauer NJC, de Brabander J, Berendschot TT, et al. Dissatisfaction after implantation of multifocal intraocular lenses. J Cataract Refract Surg [Internet]. 2011 May;37(5):859–65. Available from: https://journals.lww.com/02158034-201105000-00011
11. Labiris G, Giarmoukakis A, Patsiamanidi M, Papadopoulos Z, Kozobolis VP. Mini-monovision versus multifocal intraocular lens implantation. J Cataract Refract Surg [Internet]. 2015 Jan;41(1):53–7. Available from: https://journals.lww.com/02158034-201501000-00010
12. Ito M, Shimizu K, Amano R, Handa T. Assessment of visual performance in pseudophakic monovision. J Cataract Refract Surg [Internet]. 2009 Apr;35(4):710–4. Available from: https://journals.lww.com/02158034-200904000-00030
13. de Silva SR, Evans JR, Kirthi V, Ziaei M, Leyland M. Multifocal versus monofocal intraocular lenses after cataract extraction. Cochrane Database Syst Rev [Internet]. 2016 Dec 12;2016(12). Available from: http://doi.wiley.com/10.1002/14651858.CD003169.pub4

14. Maxwell WA, Waycaster CR, D'Souza AO, Meissner BL, Hileman K. A United States cost–benefit comparison of an apodized, diffractive, presbyopia-correcting, multifocal intraocular lens and a conventional monofocal lens. J Cataract Refract Surg [Internet]. 2008 Nov;34(11):1855–61. Available from: https://journals.lww.com/02158034-200811000-00019
15. Sterne J, Savović J, Page M, Elbers R, Blencowe N, Boutron I, et al. RoB 2: a revised tool for assessing risk of bias in randomised trials. BMJ. 2019;366:I4898.
16. Sterne JA, Hernán MA, Reeves BC, Savović J, Berkman ND, Viswanathan M, et al. ROBINS-I: a tool for assessing risk of bias in non-randomised studies of interventions. BMJ [Internet]. 2016 Oct 12;i4919. Available from: https://www.bmj.com/lookup/doi/10.1136/bmj.i4919
17. Wilkins MR, Allan BD, Rubin GS, Findl O, Hollick EJ, Bunce C, et al. Randomized Trial of Multifocal Intraocular Lenses versus Monovision after Bilateral Cataract Surgery. Ophthalmology [Internet]. 2013 Dec;120(12):2449-2455.e1. Available from: https://linkinghub.elsevier.com/retrieve/pii/S016164201300688X
18. Labiris G, Panagiotopoulou EK, Perente A, Ntonti P, Delibasis K, Fotiadis I, et al. Premium Monovision versus Bilateral Myopic Monovision, Hybrid Monovision and Bilateral Trifocal Implantation: A Comparative Study. Clin Ophthalmol [Internet]. 2022 Mar;Volume 16:619–29. Available from: https://www.dovepress.com/premium-monovision-versus-bilateral-myopic-monovision-hybrid-monovisio-peer-reviewed-fulltext-article-OPTH
19. Chen M, Atebara NH, Chen TT. A Comparison of a Monofocal Acrysoft IOL Using the "Blended Monovision" Formula with the Multifocal Array IOL for Glasses Independence After Cataract Surgery. Ann Ophthalmol [Internet]. 2007 Oct 22;39(3):237–40. Available from: http://link.springer.com/10.1007/s12009-007-0035-4
20. Chen M. A study of monofocal intraocular lens (AcrySof®) in mini-monovision (MMV) and premium multifocal implantation of ReSTOR®. Clin Optom [Internet]. 2010 Dec;2:1–3. Available from: http://www.dovepress.com/a-study-of-monofocal-intraocular-lens-acrysof-reg-in-mini-monovision-m-peer-reviewed-article-OPTO
21. Rodov L, Reitblat O, Levy A, Assia EI, Kleinmann G. Visual Outcomes and Patient Satisfaction for Trifocal, Extended Depth of Focus and Monofocal Intraocular Lenses. J Refract Surg [Internet]. 2019 Jul;35(7):434–40. Available from: https://journals.healio.com/doi/10.3928/1081597X-20190618-01
22. Stock RA, Thumé T, Paese LG, Bonamigo EL. Subjective evaluation of uncorrected vision in patients undergoing cataract surgery with (diffractive) multifocal lenses and monovision. Clin Ophthalmol [Internet]. 2017 Jul;Volume 11:1285–90. Available from: https://www.dovepress.com/subjective-evaluation-of-uncorrected-vision-in-patients-undergoing-cat-peer-reviewed-article-OPTH
23. Zhang F, Sugar A, Jacobsen G, Collins M. Visual function and patient satisfaction: Comparison between bilateral diffractive multifocal intraocular lenses and monovision pseudophakia. J Cataract Refract Surg [Internet]. 2011 Mar;37(3):446–53. Available from: https://journals.lww.com/02158034-201103000-00005
24. Parede TRR, Torricelli AAM, Mukai A, Vieira Netto M, Bechara SJ. Quality of vision in refractive and cataract surgery, indirect measurers: review article. Arq Bras Oftalmol [Internet]. 2013 Dec;76(6):386–90. Available from: http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0004-27492013000600016&lng=en&nrm=iso&tlng=en
25. Zhao G, Zhang J, Zhou Y, Hu L, Che C, Jiang N. Visual function after monocular implantation of apodized diffractive multifocal or single-piece monofocal intraocular lens. J Cataract Refract Surg [Internet]. 2010 Feb;36(2):282–5. Available from: https://journals.lww.com/02158034-201002000-00018
26. JI J, HUANG X, FAN X, LUO M. Visual performance of Acrysof ReSTOR compared with a monofocal intraocular lens following implantation in cataract surgery. Exp Ther Med [Internet]. 2013 Jan;5(1):277–81. Available from: https://www.spandidos-publications.com/10.3892/etm.2012.740
27. Palmer AM, Faina PG, Albelda AE, Serrano MC, Saad MD, Cespedes MC. Visual Function With Bilateral Implantation of Monofocal and Multifocal Intraocular Lenses: A Prospective, Randomized, Controlled Clinical Trial. J Refract Surg [Internet]. 2008 Jan;24(3):257–64. Available from: https://journals.healio.com/doi/10.3928/1081597X-20080301-07
28. Chen T, Yu F, Lin H, Zhao Y, Chang P, Lin L, et al. Objective and subjective visual quality after implantation of all optic zone diffractive multifocal intraocular lenses: a prospective, case-control observational study. Br J Ophthalmol [Internet]. 2016 Nov;100(11):1530–5. Available from: https://bjo.bmj.com/lookup/doi/10.1136/bjophthalmol-2015-307135