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A survey of intraocular lens preferences of UK refractive surgeons for cataract surgery and refractive lens exchange

Jamil Kabbani^{1*}, Liam Price², Radhika Patel², Nizar Din² and Mukhtar Bizrah^{2,3}

Abstract

Background To explore intraocular lens (IOL) preferences of United Kingdom-based (UK) refractive surgeons in cataract and refractive lens exchange (RLE) surgery.

Methods An online survey on IOL preferences (and reasons for their choice) in cataract and RLE surgery was distributed. It also enquired about implementing mini-monovision with extended depth of field (EDoF) IOLs, about utilising IOL mix-and-match (different IOL types in each eye), and at what level of corneal astigmatism they prefer toric lenses.

Results Following an 81.6% response rate, thirty responses were analysed; median years of refractive surgery experience was 12.5. The most popular IOL choices for cataract surgery were EDoF lenses (30%), monofocals (20%), and trifocals (20%). The most cited reason for each was better overall visual outcomes (88.9%), fewer unwanted symptoms (66.7%) and best spectacle independence (66.7%), respectively.

For RLE, EDoF remained most popular (36.7%), followed by trifocals (30%), and multifocals (16.7%) with the same reasons for choice cited above.

Mini-monovision with EDoF lenses was well-regarded (83% recommend for most/select patients), unlike utilising IOL mix-and-match (60% did not recommend). 40% prefer toric IOLs for astigmatism of 1 dioptre (D) or higher, whilst 30% opt for them at < 1D.

Conclusions Experienced UK refractive surgeons prefer newer IOLs with enhanced optics; ≥50% of respondents favoured either EDoF or trifocals for a 'typical' cataract or RLE patient. Notably, respondents have a low corneal astigmatism threshold for toric lenses. Mini-monovision with EDoF IOLs was well-regarded, whilst mix-and-match of different IOL types was less recommended.

Keywords Cataract surgery, Intraocular lenses, Refractive surgery

Introduction

The technique of cataract surgery has undergone major development in the previous century, resulting in the current favoured approach of phacoemulsification with insertion of an intraocular lens (IOL), which has revolutionised visual outcomes and recovery time [1–3].

Over the last two decades ophthalmology has witnessed an accelerating evolution of IOLs, to maximise the visual function of patients after cataract surgery and refractive lens exchange (RLE) [4]. Whilst partly borne

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out of a desire to meet patient demands for better visual outcomes, spectacle independence, and eliminate optic phenomena, manufacturers have also designed lenses targeting patient requirements in the modern world, including lenses aiming to provide intermediate distance vision to allow for use of digital devices including smartphones, laptops, and tablets [4, 5]. This has resulted in a significant number of IOLs available on the international market, with a 2020 review finding over 70 different multifocal and extended depth of focus (EDoF) lenses to choose from [6], with numerous differences in lens construction material, filters, surface treatments, and haptics [4]. This abundance of IOL choices, with further ongoing developments in the technology, creates a potentially complex array of options for refractive surgeons to choose from.

The most commonly used intraocular lenses in the UK and around the world are monofocal lenses [5]. These have been around the longest and are the most economical option for healthcare services and patients. Monofocal lenses are low cost IOLs, which give patients good vision for targeted refractive distance (e.g. distance vision). This often necessitates the need for spectacles to see other distances (e.g. intermediate or near vision). To achieve good vision at more than one focal point (e.g. distance and near) with monofocal IOLs, a technique known as monovision (or blended vision) may be employed by the surgeon, where one eye, usually the dominant eye, is corrected for distance and the fellow non-dominant eye is given a focal point at an intermediate or near focal point [8].

Recently, more surgeons are switching to 'premium' IOLs which give patients more independence from spectacles and match higher visual demands from an increasingly discerning patient population. Toric IOLs can correct astigmatism, resulting in enhanced unaided visual outcomes [9]. Other premium IOLs such as 'premium' monofocals (offering improved intermediate vision compared to standard monofocals, with similar distance acuity and rates of photic phenomena [10, 11]), extended depth of focus lenses, and multifocal (or trifocal) IOLs are being increasingly utilised. These increase independence from spectacles, and may in some cases result in complete independence [12]. By distributing light in more than one focal point, multifocal IOLs enable the eye to see more clearly at more focal distances. Classically, the main concern with 'multifocal' IOLs has been reduced contrast sensitivity, and increased undesirable visual symptoms (e.g. glare, haloes, starbursts, etc.) when compared to monofocals [13].

With an ever-increasing variety of IOLs, there has been interest in comparing patient outcomes with different lenses [9, 13–15]. A survey of ophthalmologists

in the United States of America [16] was conducted in 2017 to elicit IOL preferences, and found that 61.3% would choose a monofocal IOL set either for distance or monovision for their own surgery. There has been no literature focussing on cataract or RLE surgery lens preferences amongst United Kingdom (UK) refractive surgeons. As well as revealing possible variations in surgeon lens preference, both geographically and over time, such surveys can shed light on what factors influence surgeon preferences.

In this survey of UK-based refractive surgeons, we sought to elicit IOL preferences including homogeneity amongst UK surgeons, and variation in preference according to a 'neutral' patient not averse to the alternative of wearing contact lenses or glasses.

Methods

An online survey consisting of eight questions (Table 1) was created using Google Forms (Alphabet Inc., Mountain View, CA, USA) and distributed to refractive surgery consultants across the UK. The questionnaire was sent to surgeons by email and mobile phone messages to maximise response rates, and results were analysed using Microsoft Excel (Microsoft Corporation, Redmond, Washington, USA).

Inclusion criteria were UK consultants who in their practice perform cataract surgery, refractive lens exchange (RLE), and laser refractive surgery. Consultants with less than 3 years of experience were excluded from the results, in order to select for those with substantial patient experience.

Results

31 out of 38 refractive surgeons across the UK filled out the survey - an 81.6% response rate. All respondents filled out the survey in full. One respondent was excluded from the study due to having only one year experience as a refractive surgeon. The median number of years of practice as a refractive surgeon was 12.5, with a range of 3–31 years.

The most popular IOL choice for a "typical cataract surgery patient without ocular co-pathology or ocular surface issues" was EDoF (30%), followed by monofocal (20%) and trifocal (20%) (Fig. 1, panel A). When asked to elaborate on the reason for their preferred lens choice (question allowed for multiple responses to be selected), 66.7% expressed that it was due to improved visual outcomes, 36.7% chose their IOL as they felt it resulted in fewer unwanted symptoms, and 26.7% felt their lens choice provided the best spectacle independence (Fig. 1, panel B).

Amongst those with under ten years of experience (11 respondents), EDoF lenses were most popular (45.5%),

Table 1 Questions and answer options in the online survey distributed to UK-based refractive consultants

Question
How many years have you been practicing as a refractive surgeon? (Free text answer box)
What is your overall preferred IOL choice for the typical cataract surgery patient? Assuming there is no ocular co-pathology and no ocular surface issues.
<ul style="list-style-type: none"> • Monofocal • Premium monofocal • Extended depth of focus • Trifocal • Multifocal • All the above • Other (with option for free text answers)
What is the reason for your IOL preference in a typical cataract surgery patient? Multiple options allowed.
<ul style="list-style-type: none"> • Better overall visual outcome • Fewer unwanted symptoms • Patient preference • Cost of lens • Best spectacles independence • Other (with option for free text answers)
What is your overall preferred IOL choice as a surgeon for the typical refractive lens exchange (RLE) presbyopic patient who is over 50 years of age? Assuming there is no ocular co-pathology and no ocular surface issues.
<ul style="list-style-type: none"> • Monofocal • Premium monofocal • Extended depth of focus • Trifocal • Multifocal • All the above • Other (with option for free text answers)
What is the reason for your IOL preference in RLE patients? Multiple options allowed.
<ul style="list-style-type: none"> • Better overall visual outcome • Fewer unwanted symptoms • Patient preference • Cost of lens • Best spectacles independence • Other (with option for free text answers)
In cataract or RLE surgery, do you think it is a good idea to implement mini-monovision when using EDoF lenses?
<ul style="list-style-type: none"> • Yes, for most patients • Yes, for selected patients • No, in general I do not recommend it • Never • I do not routinely use EDoF lenses
Do you think that 'mix and match' of a trifocal/multifocal IOL with another IOL type (e.g. monofocal) is a good idea?
<ul style="list-style-type: none"> • Yes, for most patients • Yes, for selected patients • No, in general I do not recommend it • Never • Other (with option for free text answers)
For cataract or RLE surgery, at what level of cornea astigmatism would you prefer to implant a toric IOL?
<ul style="list-style-type: none"> • < 1D • 1D or higher • 1.5D or higher • 2D or higher • 2.5D or higher • I do not use toric IOLs • I prefer other techniques to treat cornea astigmatism • Other (with option for free text answers)

followed by trifocals (27.3%). Surgeons with ten or more years' experience (19 respondents) favoured monofocals (26.3%), followed by EDoF lenses (21.1%), with trifocals tied for third with "all above" (15.8% each).

When asked for their preferred IOL for a RLE in a presbyopic patient aged over 50 (assuming no ocular co-pathology or ocular surface issues), EDoF remained the most popular choice (36.7%), followed by trifocals

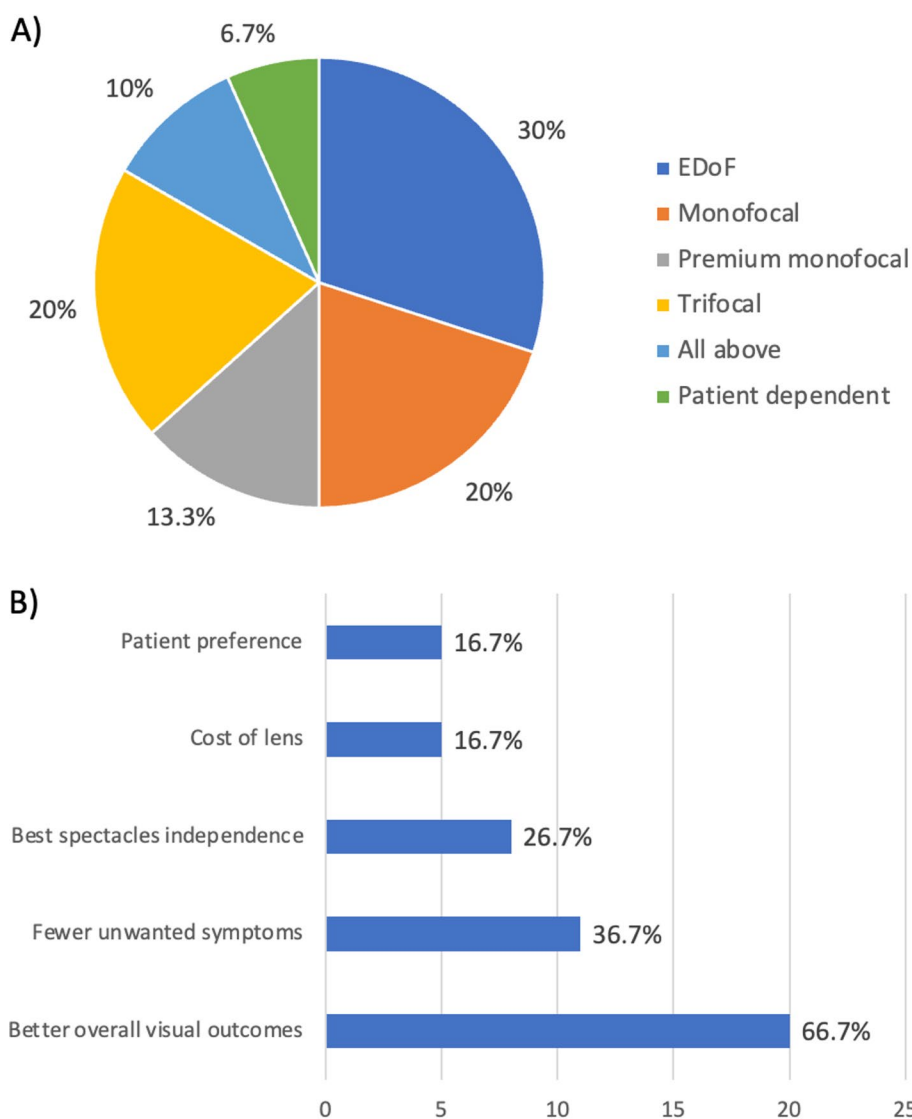


Fig. 1 Cataract surgery IOL preferences and reasoning. Preferred IOL for a "typical cataract surgery patient without ocular co-pathology or ocular surface issues" (panel **A**), and the reasoning for their choice (panel **B**). Abbreviations: EDoF: extended depth of focus

(30%), and multifocals (16.7%) (Fig. 2, panel A). When asked for their reasoning (in a question allowing multiple responses to be selected), better visual outcomes was the most cited reason (60%), followed by best spectacle independence (43.3%), and fewer unwanted symptoms (40%) (Fig. 2, panel B)

Fisher’s Exact Test was done to compare preferred IOL in cataract surgery to preferred IOL in RLE, and found that there was a significant relationship between the variables ($P=0.0443$), suggesting there was a significant relationship between lens preferences and surgery type.

Amongst surgeons with less than ten years’ experience, EDoF lenses remained the most popular (54.5%),

followed by trifocals again (27.3%). Respondents with ten or more years experienced favoured trifocals (31.6%), followed by EDoF lenses (26.3%), and multifocals (21.1%)

When asked if they recommend implementing mini-monovision with EDoF lenses in cataract or RLE surgery, 43.3% of survey participants confirmed they do for select patients, whilst 40% reported recommending it for most patients. The remaining 16.7% of participants were not in favour of recommending it.

Amongst surgeons with less than ten years’ experience, 36% recommended the approach for most patients and 55% recommended it for select patients, compared to 42% and 37% respectively in respondents with ten or

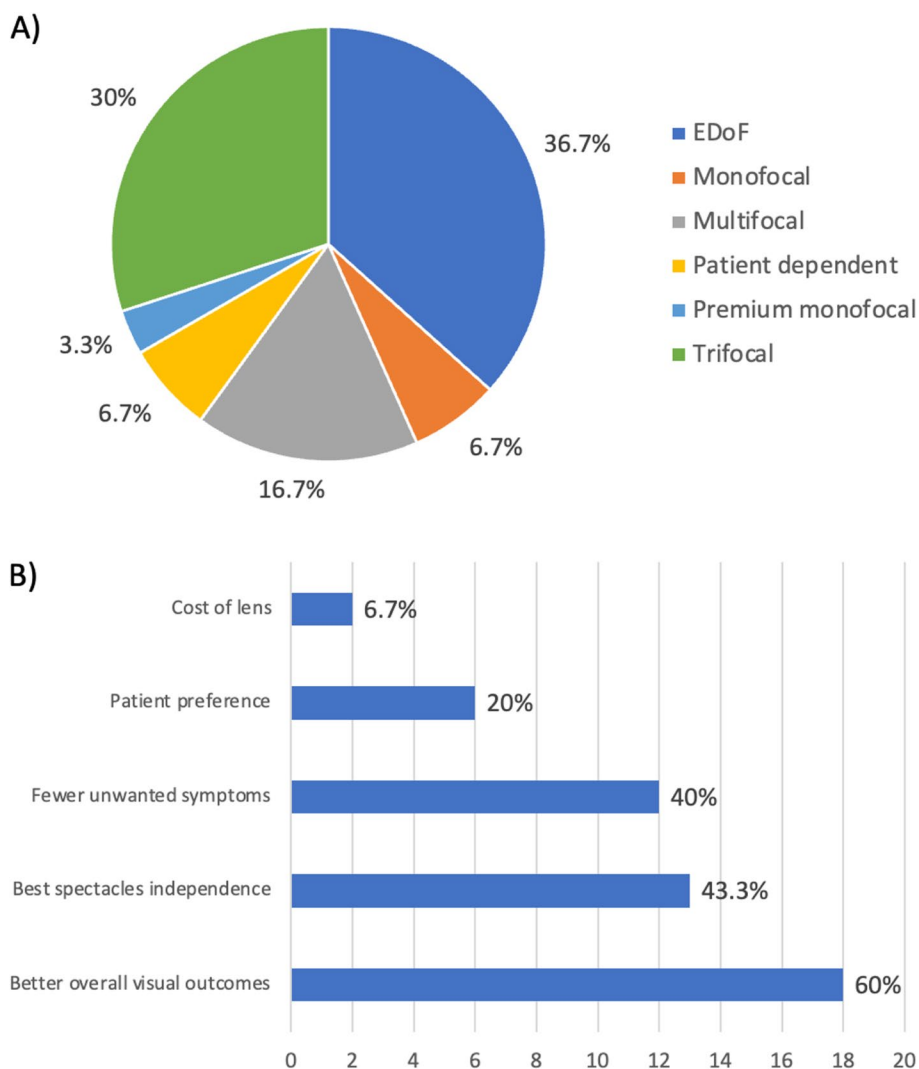


Fig. 2 RLE IOL preferences and reasoning. Preferred IOL for a RLE in a presbyopic patient over the age of 50 (panel A), and the reasoning for their choice (panel B). Abbreviations: EDoF: extended depth of focus

more years’ experience. Fisher’s Exact Test suggested no significant relationship between the experience grouping and expressed views ($P=0.6864$).

Regarding a “mix and match” of a trifocal/multifocal IOL with another IOL type (e.g. monofocal), 60% of respondents said they do not recommend it, 26.7% said they would recommend it for select patients, and 6.7% said they would recommend it for most patients. One respondent said they did not have experience with this, whilst another said that whilst they had not recommended it in the past, they were increasingly utilising it after seeing positive outcome data (these respondents had 12 and 15 years of experience, respectively).

None of the surgeons with less than ten years’ experience recommended the “mix and match” approach.

In those with ten or more years’ experience, 11% recommended the approach for most patients, 42% recommended it for some patients, and 37% did not recommend it. Fisher’s Exact Test suggested there was a significant relationship between the experience grouping and expressed views ($P=0.003$).

When asked what level of corneal astigmatism they prefer to implant toric IOLs for cataract or RLE surgery, 40% responded 1 dioptre or higher, whilst 30% opted for <1 dioptre (Fig. 3). Three felt it depended on the axis of astigmatism, whilst one respondent reported preferring other techniques to address this issue.

Amongst respondents with less than ten years’ experience, 18%, 45%, 9%, and 18% opted for thresholds of <1 dioptre, ≥1 dioptre, ≥1.25 dioptres, and ≥1.5 dioptres.

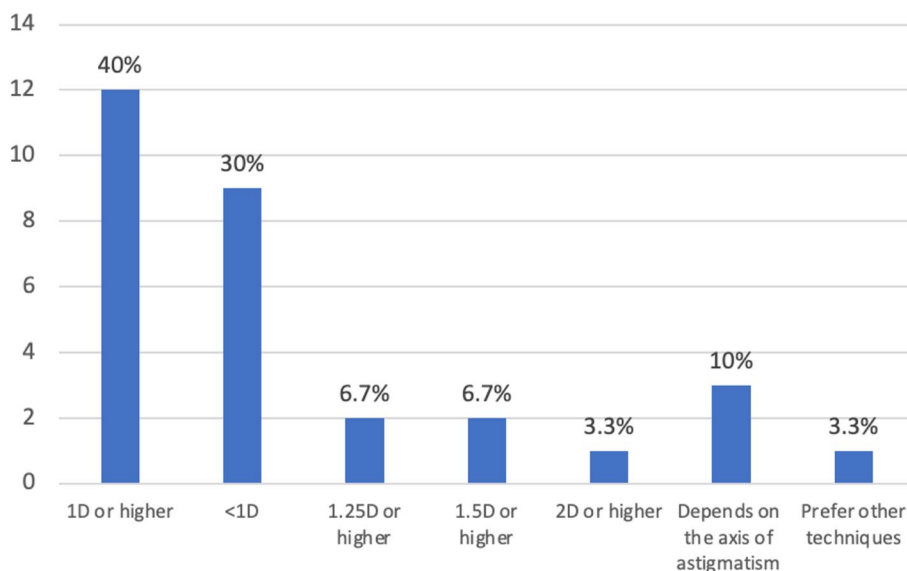


Fig. 3 astigmatism cut-off for toric IOL. Survey responses to question on what level of corneal astigmatism would they prefer toric IOL during cataract or RLE surgery. Abbreviations: D: dioptres

In the more experienced cohort, 37%, 37%, 5%, and 0% selected these thresholds, respectively. ≥ 2 dioptres was selected by one person in the more experienced cohort, whilst another in this group reported preferring other techniques. 9% of the less experienced cohort reported that it depends on the axis of astigmatism, compared to 11% in the more experienced group. Fisher’s Exact Test suggested no significant relationship between the experience grouping and expressed views ($P=0.5165$).

Discussion

With an evolving array of IOL options, there remains limited information for new and existing refractive surgeons to choose an appropriate lens for their patient [16, 17]. This is the first known UK-wide study amongst refractive surgery specialists that evaluated surgical preferences and reasons for their particular IOL choice. In the UK, patients undergoing cataract surgery under the National Health Service (NHS) will be limited to either monofocal or occasionally toric depending upon the individual trust policy. However, in the private sector, patients have access to more lens options. This effectively meant that our survey called on surgeons to reflect on their preferences in their private practice, where premium IOLs are more readily available and where patient demands and expectations are expected to be greater. Specifically, the survey was designed to stimulate surgeons into thinking about a patient with visually significant cataract, but no specific visual requirements (e.g. no aversion to wearing glasses/contacts), to elicit their thoughts and methods of practice in a ‘neutral’ scenario.

A recent study of survey responses from delegates to the European Society Of Cataract & Refractive Surgeons (ESCRS) conferences showed increasing use of EDoF lenses, up to 27.6% in 2021 [17]. This is similar to our own findings of 30% of UK-based surgeons preferring EDoF lenses, but they found much higher use of trifocal lenses (51.5% in 2021) compared to our results (20%). A 2021 systematic review and meta-analysis (SRMA) in Nature found that whilst trifocals resulted in better uncorrected and corrected near VA, EDoF lenses provided better uncorrected intermediate VA [18]. Furthermore, whilst trifocals provided higher rates of spectacle independence, they were also more likely to generate halos. However, a more recent SRMA published in 2023 comparing EDoF versus trifocal lenses found the latter provided improved uncorrected near visual acuity (VA) and improved spectacle independence, with no statistically significant differences in uncorrected distance or intermediate VA, haloes, contrast sensitivity, glare, or patient satisfaction [19].

EDoF lenses remain the newest form of IOL technology, with the first example approved for the European market in 2014 [20]. However, it has seen a significant uptake in use and popularity amongst refractive surgeons, owing to the relative diminished side effect profile and yet provides spectacle independence for the modern-day patient, where intermediate visual function for mobile phone and computer technology use are essential.

Of note, surgeons with less than ten years of experience ($n=11$) showed a preference for EDoF lenses in cataract surgery (45.5%), aligning with the overall group results.

However, in those with ten or more years' experience ($n=19$), monofocals were the most popular (26.3%). Considering EDoF lenses have only been available in Europe for less than a decade [20], this may reflect a desire by more experienced surgeons to stick to IOLs with which they are more familiar. Nevertheless, even amongst longer-practicing surgeons, EDoF preference rates were very similar to those of monofocals (21.1% versus 26.3%, respectively).

Whilst the analysis of ESCRS surveys did not explore motivation for preferred lens choice, they reported the biggest reasons cited as barriers to performing more presbyopia-correcting IOL procedures were cost to patient (59.1%), night vision quality (53.9%), and loss of contrast sensitivity (39.1%) [17]. Interestingly, cost was not one of the main concerns of surgeons in our current survey, possibly due to the patient cohort treated by our respondents mainly being private patients who may rely on health insurance or self-funding.

When looking at the three most popular IOL options for a typical cataract patient in our study, there was a different top cited reason for each. For the nine surgeons who selected EDoF lenses as their preferred IOL, eight cited "better overall visual outcomes". Of the six who picked trifocals as their IOL of choice, four cited "best spectacles independence" for their selection. For monofocal lenses, also favoured by six surgeons, four reasoned these produce "fewer unwanted symptoms".

As well as favourable visual outcomes [21], some of the newer EDoF lenses have been shown to have the same rate of visual disturbances (e.g. haloes) as a standard monofocal IOLs [22]. This may explain the preferences for EDoF in our survey and the reasons cited. The view on trifocals providing better spectacle independence concurs with the findings of the 2023 SRMA [19], as does the view that monofocals are generally less likely to produce unwanted symptoms compared to multifocal or EDoF lenses [23].

RLE is increasingly being utilised in non-cataractous patients interested in addressing their presbyopia or need for spectacles [24, 25]. In our survey, EDoF and trifocals were the IOLs of choice for RLE for 66.7% of respondents. These lenses have been shown to achieve good visual outcomes, with no significant differences between the two for intermediate VA, but improved near VA with trifocals [26]. This aligns with the most cited reason for those preferring trifocals in our survey (of the nine respondents preferring trifocals for RLE, seven cited better visual outcomes as their reason). Amongst those selecting EDoF lenses, most selected fewer unwanted symptoms as their reasoning (10 votes, from 11 respondents who picked EDoF). Some studies have shown EDoF lenses may result in less intense

halos or improved night performance compared to trifocals [27], and rates of halos and glare similar to monofocals [28].

Interestingly, there was a significant relationship between lens preferences and surgery type (Fisher's Exact Test, $P=0.0443$). Whilst EDoF lenses were the most popular lens type for both surgeries (selected by 30% and 36.7% as the preferred IOL for cataract and RLE, respectively), one evident example of IOL preferences differing was for multifocals. These were favoured by five surgeons for RLE but by none of the surgeons for cataract surgery, possibly due to concerns regarding reduced contrast sensitivity as compared to monofocals when used for cataract surgery [29]. Monofocals and premium monofocals also proved to be three and four times more popular respectively for cataract surgery as compared to RLE. Of the ten respondents who preferred these lenses for cataract surgery, six cited "fewer unwanted symptoms", suggesting this may be key for informing lens selection in cataract surgery. However, this was also a key reason selected by those who preferred EDoF lenses for RLE (cited by 10 of the 11 respondents who favoured EDoF).

Notably, amongst surgeons with less than ten years' experience, EDoF (54.5%) and trifocal lenses (27.3%) were the first and second most popular IOLs for RLE surgery, aligning with overall group preferences. Whilst a preference for newer lens types was also seen amongst surgeons with ten or more years' experience, in this subgroup, trifocals (31.6%) were the most popular lens type, followed by EDoF lenses (26.3%). Nevertheless, the results show most surgeons favour premium IOLs for RLE surgery, possibly due to these offering improved spectacle independence and near VA (which helps with interacting with digital devices) when compared to monofocals [13].

Premium monofocals proved to be a more popular option for cataract surgery (chosen by 13.3% of respondents as their IOL of choice) than it was for RLE surgery (where it was the preferred IOL of 3.3% of respondents). This is possibly because whilst they may have some benefits over monofocals for typical cataract surgery (where 20% of surgeons opted for monofocals), they may not offer the same benefits that other premium IOLs can deliver for RLE surgery (including better VA at a wider range of distances) [30].

However, care should be taken with patient selection and counselling during both presbyopic RLE and refractive cataract surgery. Whilst anatomical/ocular considerations are important, so are the patient needs (e.g. a dependence on night vision may preclude the use of multifocals due to their increased association with optic phenomena in low-light settings compared to monofocals), and patient personality types should be considered;

“type-A” or “perfectionist” personalities have been shown to be less likely to tolerate multifocal outcomes [31].

EDoFs can also be used to implement a degree of mini-monovision during cataract or RLE surgery. When asked about using EDoF lenses to achieve mini-monovision, most survey respondents reported recommending it (43.3% recommending it for select patients, 40% recommending it for most patients). When stratifying by years of experience, there was no significant relationship between the experience grouping (less than ten years versus ten years or more experience) and the view on mini-monovision (Fisher’s Exact Test, $P=0.6864$).

EDoF implantation targeted to mini-monovision of -0.50 D has been shown to produce good uncorrected VA at far, intermediate, and near distance, with low rates of spectacle dependence or photic phenomena [32]. Furthermore, in a prospective international multicentre study comparing bilateral EDoF implantation with intended emmetropia to monovision, the latter had significantly improved uncorrected intermediate and near VA, and similarly low rates of spectacle dependence and undesirable visual symptoms [33]. Also worth noting are the results of a sub-analysis of the CONCERTO study, which examined the results of different levels of monovision with an extended range of vision IOL [34]. This showed different levels of monovision were better at different outcomes (e.g. spectacle independence, uncorrected far vs. near VA, etc.), with the authors determining that mini-monovision of around -0.75 D achieved the best balance of outcomes. These findings could be considered when deciding on the level of monovision most likely to achieve the patient’s own priorities.

Respondent opinions in the current survey regarding the mixing of multifocals with another IOL, such as a monofocal, was more guarded, with 60% of the respondents not recommending this approach. In one study assessing multifocal-monofocal patients, 65% achieved spectacle independence, which is higher than would be expected with bilateral monofocal IOLs [35]. The study grouped multifocal-monofocal patients with multifocal-phakic patients (i.e. only one eye had undergone a procedure), and compared them to eyes with bilateral multifocals. They found that the latter group had significantly improved satisfaction scores and uncorrected near VA, whilst differences in rates of halos and spectacle independence did not reach a statistically significant level. In another study comparing toric-monofocal paired with a monofocal IOL to a toric-monofocal paired with a multifocal IOL, the latter group had improved spectacle independence and uncorrected near VA, but poorer stereopsis and contrast sensitivity [36]. Other studies have looked at mixing differently powered bilateral bifocals or bilateral trifocals [37], mixing a refractive with

a diffractive multifocal [38, 39], a trifocal with a bifocal [40], EDoF with a multifocal/trifocal [41, 42], and extended range-of-vision with a bifocal [43]. These different combinations have yielded benefits including better visual outcomes, lower rates of photic phenomena, or less reduced contrast sensitivity, with positive outcomes relating to VA, spectacle independence, and photic phenomena. Nevertheless, the limited number of studies making direct comparisons makes drawing conclusions on the practice of mix-and-matching lenses more difficult. Furthermore, much of the literature comparing refractive outcomes are complicated by a lack of standardisation between studies, including at what distance to assess near or intermediate VA [5].

Interestingly, there was a significant relationship between experience grouping (less than ten years versus ten years or more experience) and the view on a “mix and match” approach (Fisher’s Exact Test, $P=0.003$). Whilst none of those with less than ten years of experience recommended it, 11% and 42% of those with ten or more years’ experience recommended it for most or select patients, respectively. This may reflect greater experience, as one of the respondents stated they were increasingly using the technique after seeing positive outcome data.

Toric IOLs are an option for cataract surgery or RLE where there is also a degree of astigmatism [31], and have been shown in SRMAs to provide superior visual outcomes in astigmatic eyes undergoing cataract surgery than non-toric IOLs [9], or even non-toric IOLs paired with a relaxing incision [44]. The study of ESCRCS respondent preferences also showed that use of toric lenses had more than doubled, with cost cited as a significant barrier to even higher use rates [17]. In our own study, a significant proportion of respondents reported a low threshold of astigmatism for considering a toric lens; 30% responded <1 D, with a similar proportion (40%) opting for ≥ 1 D. When stratifying participants into groups based on experience (less than ten years versus ten years or more experience), there was no significant relationship between experience grouping and astigmatism threshold for toric IOL (Fisher’s Exact Test, $P=0.5165$). Published literature has demonstrated that patients with astigmatism from 0.75 D benefit from toric IOLs [45]. Furthermore, only one respondent reported preferring alternative astigmatic techniques, which may suggest a move away procedures such as limbal relaxing incisions (which a Cochrane review found produced less favourable results than toric lenses [46]).

This study has a few limitations. Firstly, our survey reports the preferences of 30 refractive surgeons, and is hence not a large survey and hence not conclusive of UK-wide practice. On the positive side, the response rate is high (81.6%). The respondents are specialised in

refractive surgery, meaning they are experienced in both cataract surgery and RLE. Although this study focussed on various categorisation of intraocular lenses (monofocal, monovision, toric, EDOF and multifocals), a further study should be expanded to look at the different makes and brands of IOLs, and choices surgeons make. It is conceivable the choice of answers is biased towards a historical brand loyalty, lens injector mechanism, and degree of unfolding to name but a few factors, rather than the optics of the IOL. In this study, we did not include some of the other rarer IOLs such as accommodative lenses, light-adjustable lens or phakic IOLs. The latter was not the remit of the study which wanted to focus exclusively on crystalline lens extraction and intraocular lens implantation. Finally, this questionnaire did not look into femtosecond laser assisted cataract surgery. It is feasible that such advanced level of technology may be coupled with premium lenses and hence may influence intraocular lens decision making. A further study would be warranted in this case.

Conclusion

In conclusion, this study sheds light into the behaviour patterns of refractive surgeons in the UK when it comes to RLE and cataract surgery. We demonstrate that for cataract and RLE surgery, EDoF lenses are the most popular choice amongst UK refractive surgeons, driven by a desire for better visual outcomes and less visual disturbances. Mini-monovision with EDoF IOLs appears to be a popular option. Mix and matching of multifocal IOLs with another IOL type in the other eye is not common practice, possibly due to a more limited research base for this approach. Toric lenses are used for less than 1D of astigmatism by almost a third of respondents, and for anyone with 1D or more by 40%, indicating a low threshold for toric IOL use, correlating with published evidence of excellent patient outcomes.

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Author contributions

All authors read and approved the final manuscript. JK analysed and interpreted the data, and drafted the article. LP helped conceptualise the study, prepare and distribute the survey, and substantially revised/critically reviewed the article. RP helped conceptualise the study and prepare the survey, and substantially revised/critically reviewed the article. ND helped conceptualise the study, prepare and distribute the survey, and substantially revised/critically reviewed the article. MB helped conceptualise the study, prepare and distribute the survey, and substantially revised/critically reviewed the article.

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Data availability

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

ethics approval not required as per the HRA and MRC decision tool (<https://www.hra-decisiontools.org.uk/ethics/>). Informed consent was obtained from survey participants for participation in the study.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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