Additional file 1: Supplementary Tables S1 and S2

Photopic and Mesopic Contrast Sensitivity Changes After Cataract Surgery: Visit-to-Visit AULCSF Reproducibility and Functional Outcomes

Table S1 AULCSF improvement (ΔAULCSF), standardized response mean, and proportion of eyes exceeding MDC_{95} by preoperative AULCSF quartile and luminance condition

Luminance	Quartile	Preop AULCSF	Eyes (N)	ΔAULCSF (SD)	SRM	% > MDC_{95} (0.540, primary)	% > MDC_{95} (0.356, quality-controlled)
Mesopic	Q1	0.30–0.95	540	+0.552 (0.306)	1.80	50.7	75.6
	Q2	0.96–1.16	514	+0.297 (0.233)	1.28	13.8	41.2
	Q3	1.17–1.34	509	+0.177 (0.219)	0.81	2.9	22.6
	Q4	1.35–1.97	485	+0.023 (0.205)	0.11	0.0	3.3
Photopic	Q1	0.30–0.62	170	+0.889 (0.324)	2.75	84.1	92.9
	Q2	0.63–0.83	161	+0.627 (0.317)	1.98	64.6	77.0
	Q3	0.84–1.11	161	+0.493 (0.279)	1.77	46.0	75.2
	Q4	1.13–1.85	161	+0.153 (0.277)	0.55	5.6	27.3

Quartiles were defined within each luminance condition using its own preoperative AULCSF distribution; the preoperative AULCSF column shows the observed minimum–maximum of each quartile (quartiles are luminance-specific and are not matched strata; matched absolute ranges are given in Table S2 and Additional file 2: Fig. S3). ΔAULCSF = postoperative − preoperative AULCSF; values are mean (SD). SRM = standardized response mean (mean ΔAULCSF / SD of ΔAULCSF). The proportion of eyes whose ΔAULCSF exceeded the visit-to-visit MDC_{95} is shown for the primary estimate (0.540 log units, all 192 visit-to-visit pairs) and for the quality-controlled sensitivity estimate (0.356 log units, 160 pairs with $|\Delta AULCSF| < 0.44$). P for trend across quartiles < 0.001 in both conditions (cluster-robust regression on quartile rank). As a sensitivity analysis, luminance-specific primary MDC_{95} values were also applied: ΔAULCSF exceeded the condition-specific MDC_{95} in 21.9% of mesopic eyes (MDC_{95}, 0.491; 156 pairs) and 36.0% of photopic eyes (MDC_{95}, 0.718; 36 pairs), and the condition-specific upper 95% limit of agreement in 11.4% (0.644) and 27.9% (0.817), respectively, preserving the direction of the primary analysis (combined MDC_{95} 0.540: 17.6% and 50.5%).

Table S2 AULCSF improvement (ΔAULCSF) by matched absolute preoperative AULCSF range under mesopic and photopic testing, in the pooled two-center cohort and within Koedo Eye Institute

	Pooled two-center cohort				Koedo Eye Institute only			
Preop AULCSF range	**Mesopic, mean (SD) [n]**	**Photopic, mean (SD) [n]**	**Difference [95% CI]**	**P value**	**Mesopic, mean (SD) [n]**	**Photopic, mean (SD) [n]**	**Difference [95% CI]**	**P value**
0.3–0.6	+0.772 (0.301) [139]	+0.901 (0.320) [160]	+0.129 [+0.055, +0.203]	< 0.001	+0.915 (0.337) [28]	+0.901 (0.320) [160]	−0.014 [−0.156, +0.129]	0.852
>0.6–0.9	+0.493 (0.268) [319]	+0.613 (0.305) [224]	+0.120 [+0.069, +0.171]	< 0.001	+0.554 (0.267) [119]	+0.613 (0.305) [224]	+0.060 [−0.005, +0.124]	0.069
>0.9–1.2	+0.298 (0.237) [722]	+0.408 (0.306) [143]	+0.110 [+0.054, +0.165]	< 0.001	+0.356 (0.232) [416]	+0.408 (0.306) [143]	+0.052 [−0.006, +0.109]	0.078
>1.2	+0.083 (0.222) [868]	+0.128 (0.260) [126]	+0.045 [−0.005, +0.095]	0.078	+0.112 (0.215) [568]	+0.128 (0.260) [126]	+0.016 [−0.035, +0.067]	0.540

ΔAULCSF = postoperative − preoperative AULCSF; values are mean (SD) with the number of eyes in brackets. Ranges are inclusive of both bounds for 0.3–0.6 and right-closed thereafter, so the four ranges jointly partition all eyes (pooled: mesopic 2,048, photopic 653; Koedo Eye Institute: mesopic 1,131, photopic 653). Photopic eyes are identical in the two halves of the table (all photopic testing was performed at Koedo Eye Institute). The difference (photopic − mesopic) and its 95% CI within each range were estimated by cluster-robust linear regression with patient-level clustering. In the pooled cohort the residual photopic excess within each range reflects the between-center difference among mesopic eyes (Table 3); within Koedo Eye Institute no range differed significantly, consistent with the total photopic–mesopic difference in ΔAULCSF being largely accounted for by the lower photopic preoperative AULCSF. ΔAULCSF declined monotonically with higher preoperative AULCSF under both conditions (P for trend < 0.001 in both, cluster-robust regression on range rank). The pooled strata are plotted in Additional file 2: Fig. S3.