Effect of Steepest-Meridian Clear Corneal Incision in Reducing Preexisting Corneal Astigmatism Using Meridian-Marking Method or Surgeon's Intuition

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Purpose

When performing the steepest-meridian clear corneal incision (SM-CCI), an accurate placement of the CCI meridian is considered essential. However, most surgeons do not use a special alignment technique for the incision meridian, preferring to create the incision based on their own intuition. The purpose of this study was to compare the effect of SM-CCI in reducing preexisting corneal astigmatism between eyes that underwent using a meridian-marking method and eyes that underwent SM-CCI using surgeon's intuition.

Patients and Surgical Procedures

Patients

100 eyes of 50 patients were randomized to 1 of 2 groups

1) Meridian-marking group --- 50 eyes

2) Surgeon's intuition group --- 50 eyes

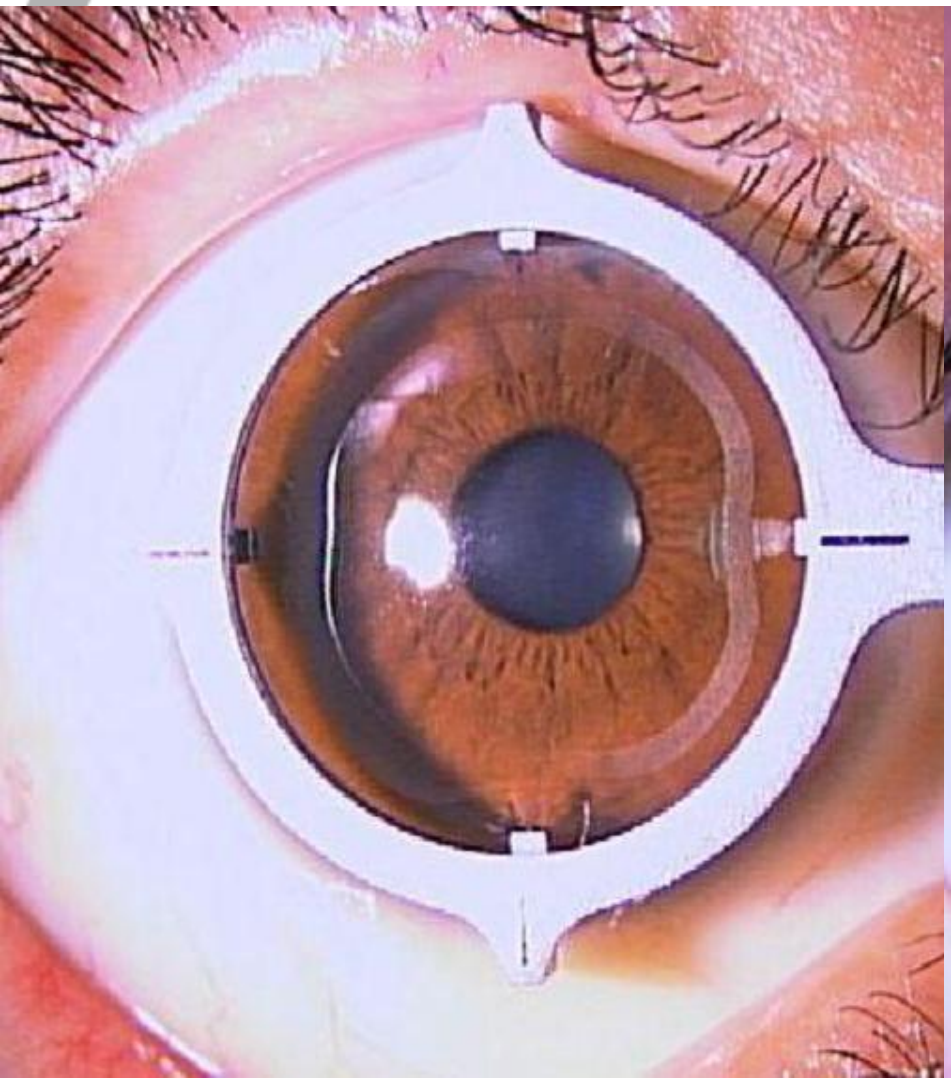
Surgical Procedures

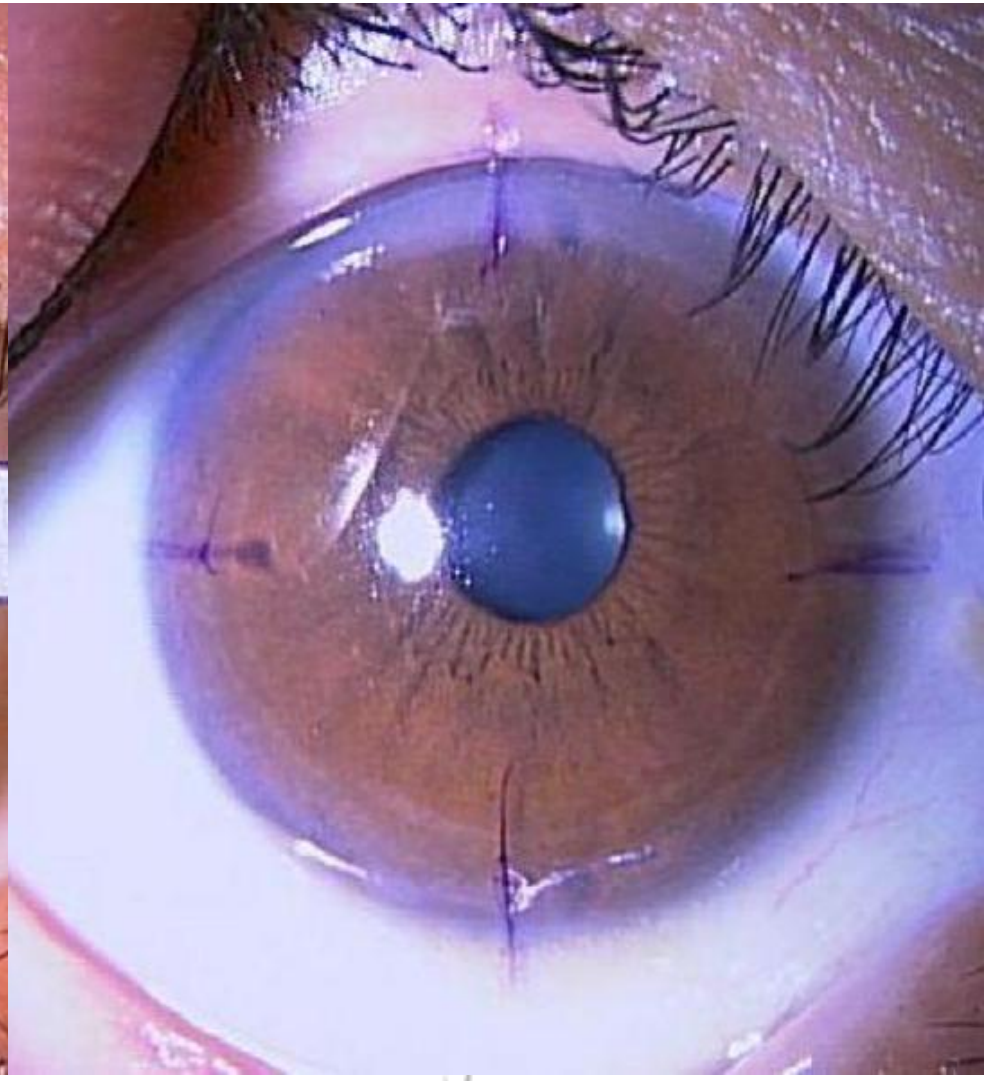
1) Preoperatively, the corneal limbus at the 0°, 90°, 180° and 270° meridians were marked using a four-point meridian-marker

2) At the beginning of surgery, the steepest meridian was marked by a knife using a toric IOL marker with the aid of the pre-placed reference points

3) 2.65-mm SM-CCI

Preoperative four-points marking





Methods

1) Anterior segment-optical coherence tomography
   ① meridian misalignment of SM-CCI
2) Autorefract-keratometer
   ② refractive astigmatism, manifest spherical equivalent value (MRSE)
   ③ corneal astigmatism, surgically induced astigmatism (SIA) determined using the Alpins method
3) Corneal topography
   ④ corneal irregular astigmatism
4) Uncorrected and corrected visual acuity
5) Wavefront analyzer ⑤ higher-order aberrations

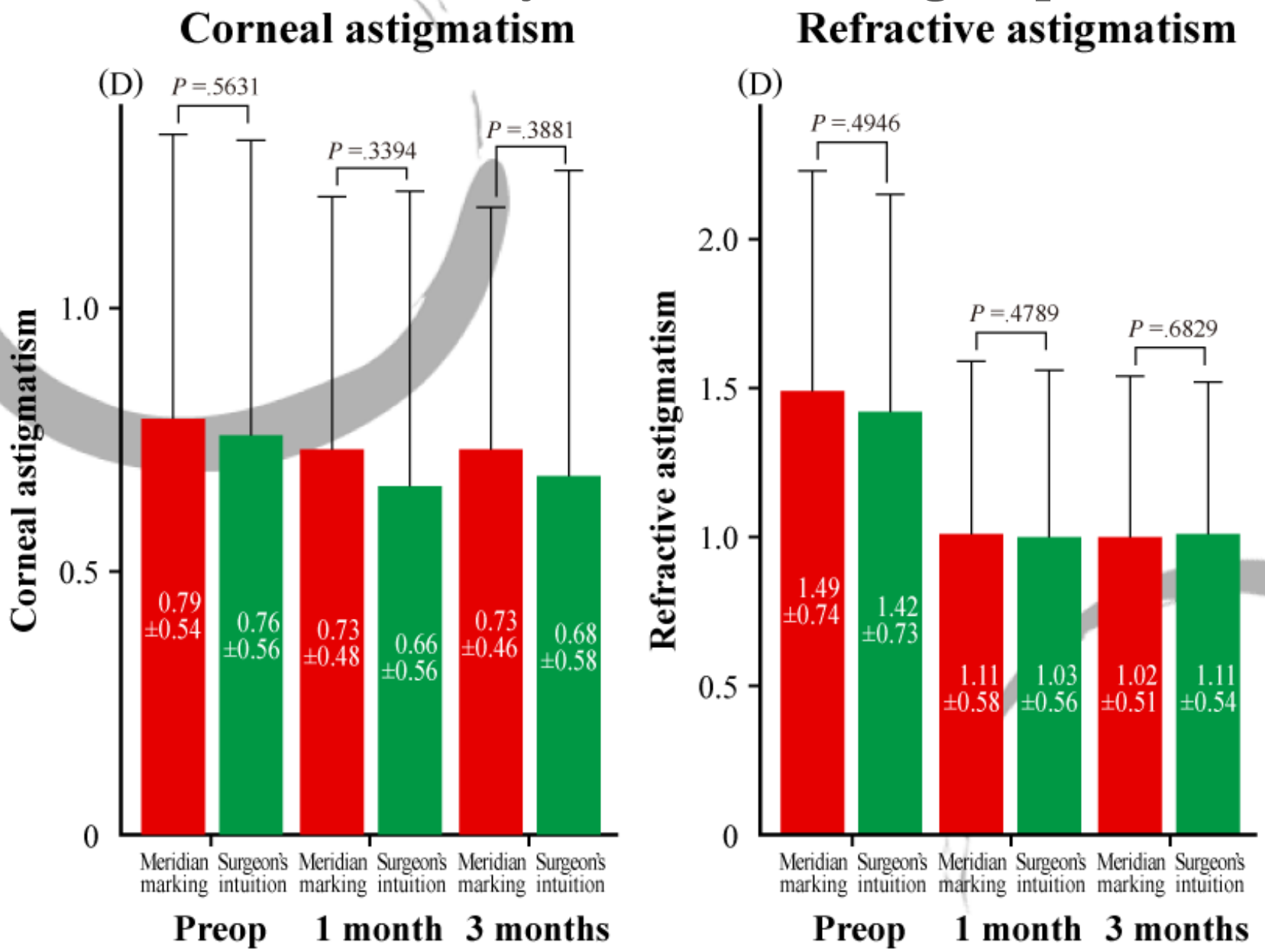
※Preoperatively and at 1 and 3 months postoperatively

Comparison of meridian misalignment between groups

	Meridian marking	Surgeon's intuition	*P*
Mean meridian misalignment (°)			
	0.04 ± 5.26	-3.22 ± 9.16	.0063*
Absolute value of meridian misalignment (°)			
	4.44 ± 2.76	8.58 ± 4.39	< .0001*
Eyes, n (%)			
≥ 5°	18 (36.0%)	35 (70.0%)	.0013*
≥ 10°	0	17 (34.0%)	< .0001*

*Statistically significant difference

Comparison of the mean corneal astigmatism and refractive cylinder between groups

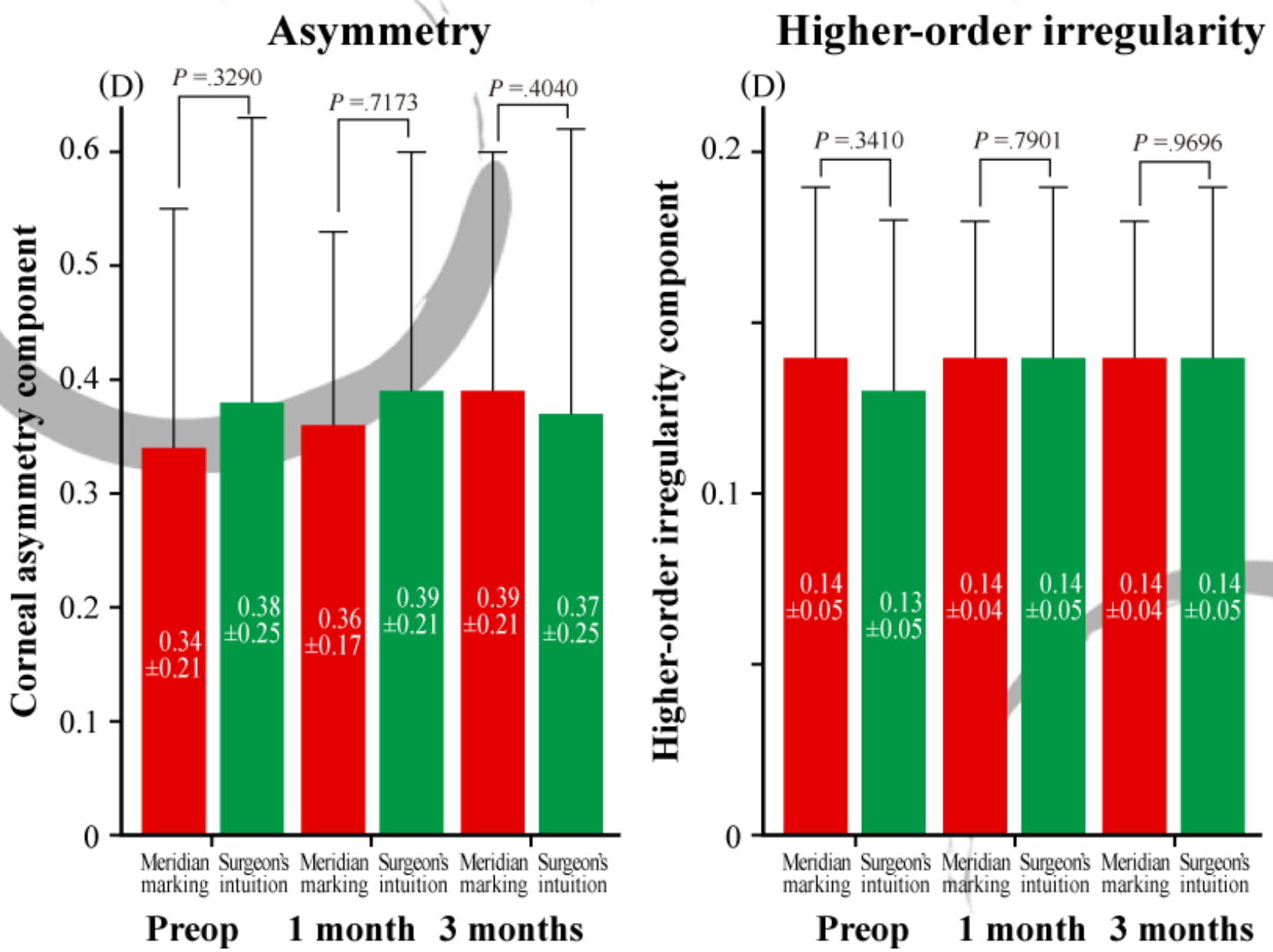


Comparison of the mean absolute value of SIA between groups

	Meridian marking	Surgeon's intuition	*P*
1 month postop			
SIA	0.43 ± 0.22	0.39 ± 0.22	.5822
Flattening (D)	0.32 ± 0.21	0.30 ± 0.21	.9470†
Torque (D)	0.20 ± 0.18	0.20 ± 0.20	
Angle of error	29.7 ± 29.3	25.9 ± 25.3	.5087
3 months postop			
SIA	0.42 ± 0.24	0.41 ± 0.24	.9724
Flattening (D)	0.33 ± 0.19	0.30 ± 0.27	.6738†
Torque (D)	0.21 ± 0.15	0.22 ± 0.19	
Angle of error	31.9 ± 28.0	29.4 ± 25.3	.6686

†Bivariate analysis for flattening and torque

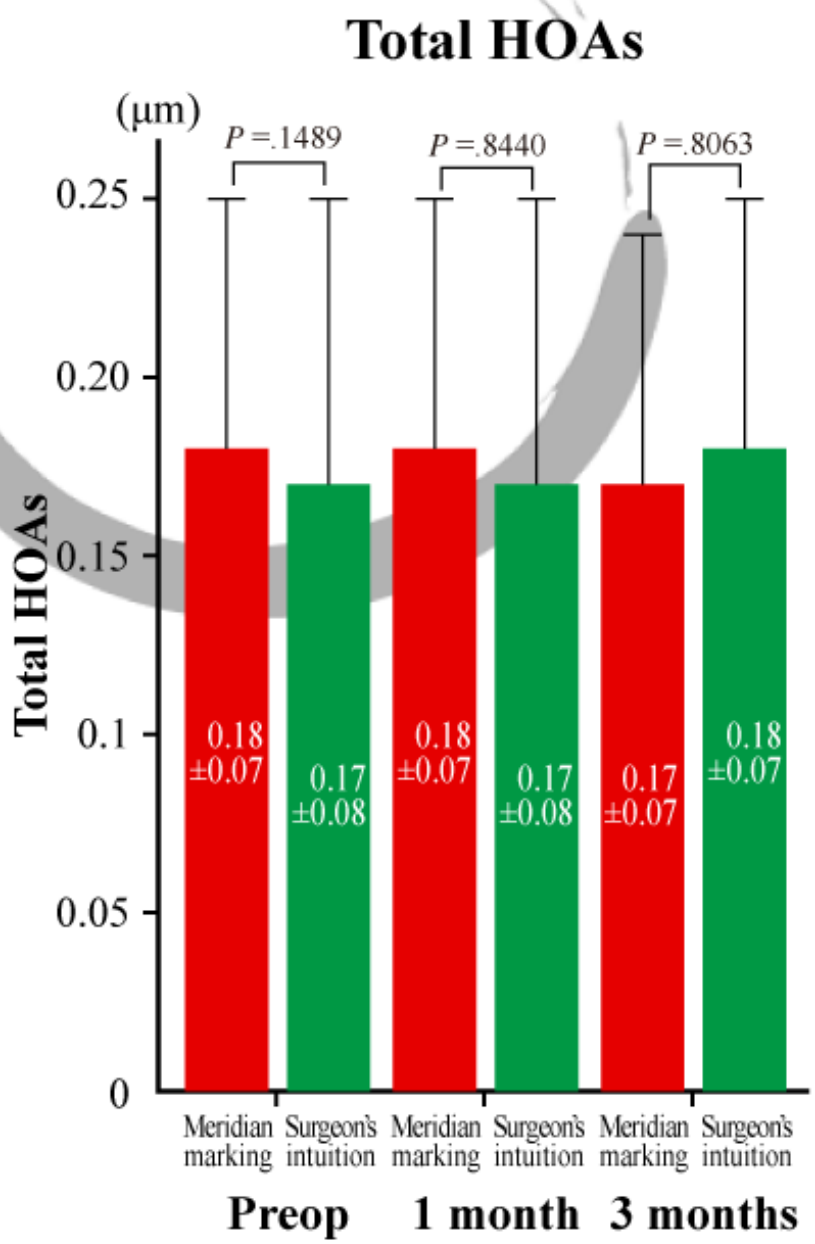
Comparison of the mean corneal asymmetry and higher-order irregularity between groups.

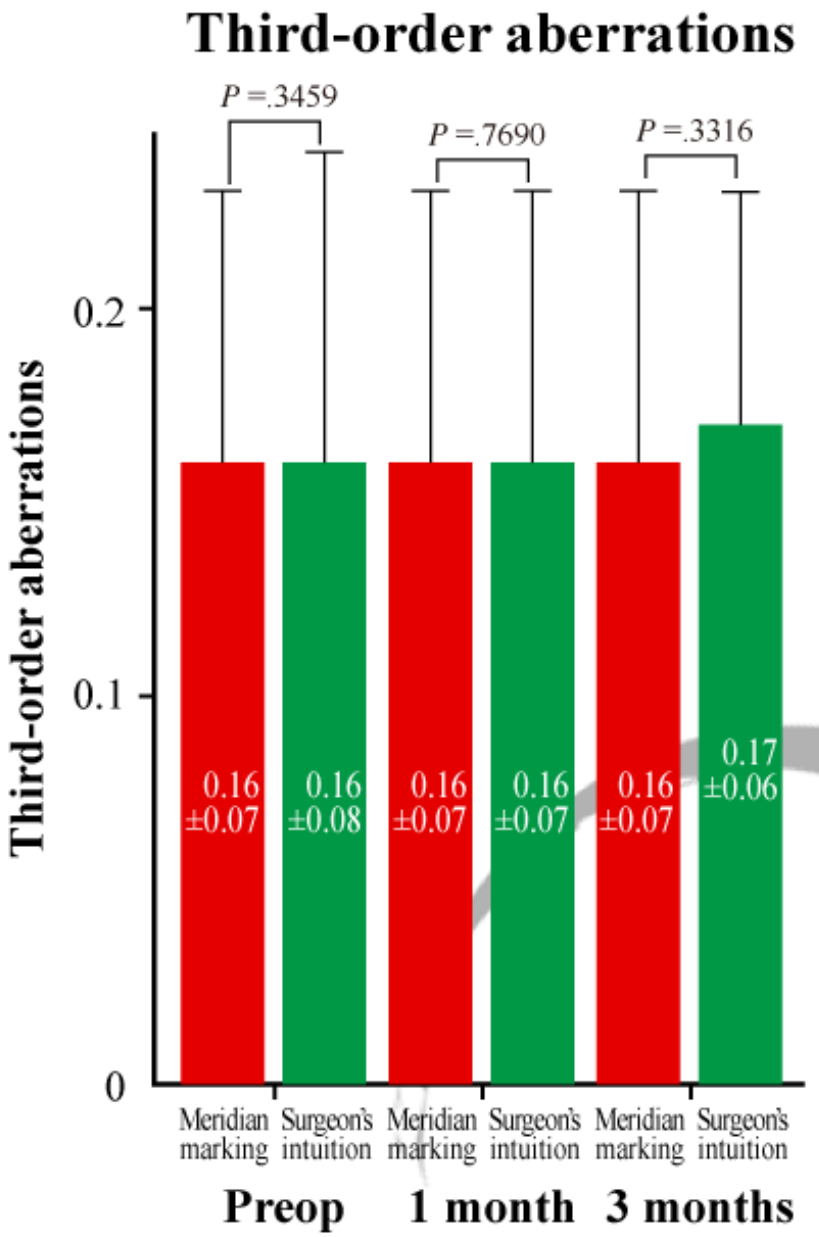


Comparison of mean uncorrected or corrected distance visual acuity between groups

	Meridian marking	Surgeon's intuition	*P*
Uncorrected (logMAR)			
Preop	0.98 ± 0.31	0.93 ± 0.35	.3851
1 month	0.21 ± 0.27	0.20 ± 0.26	.8431
3 months	0.22 ± 0.27	0.21 ± 0.26	.8348
Corrected (logMAR)			
Preop	0.48 ± 0.20	0.47 ± 0.24	.6686
1 month	-0.02 ± 0.06	-0.01 ± 0.06	.8159
3 months	-0.15 ± 0.06	-0.01 ± 0.06	.9701

Comparison of the mean corneal total HOAs and 3rd-order aberrations between groups





Conclusion

The meridian misalignment of 2.65-mm SM-CCI was significantly smaller when based on the preoperative meridian marking method than when based on the surgeon's intuition, but the effect of the difference was not large enough to decrease remaining corneal or refractive astigmatism and higher-order aberrations, or to improve uncorrected or corrected visual acuity.