Table 3. Optical biometry data of the participants

	Preoperative	1st week	1st month	3rd month	6th month	p
Axial Length (mm)						
Group 1	23.08±0.66	23.13±0.62	23.11±0.62	23.07±0.68	23.11±0.74	**0.022**
Group 2	23.67±1.39	23.07±0.68	23.71±1.38	23.63±1.40	23.71±1.39	**0.014**
Group 3			23.58±0.95			
p	0.375	0.496	0.433	0.472	0.490	
Anterior Chamber Depth (mm)						
Group 1	3.76±0.16	3.72±0.23	3.71±0.20	3.67±0.23	3.70±0.22	0.927
Group 2	3.58±0.34	3.52±0.34	3.55±0.34	3.53±0.33	3.53±0.35	**0.002**
Group 3			3.54±0.36			
p	0.248	0.180	0.529	0.436	0.479	
Flat Keratometry (D)						
Group 1	42.71±0.73	42.77±0.70	42.86±0.77	42.70±0.89	42.68±0.68	0.170
Group 2	42.37±1.79	42.33±1.63	42.44±1.58	42.26±1.77	42.20±1.88	**0.047**
Group 3			42.41±1.95			
p	0.642	0.468	0.525	0.553	0.414	
Steep Keratometry (D)						
Group 1	43.53±1.05	43.69±1.09	43.93±1.17	43.86±1.28	43.71±1.09	0.660
Group 2	43.84±1.70	44.31±1.57	44.14±1.60	43.90±1.70	43.85±1.78	**0.003**
Group 3			43.41±1.76			
p	0.601	0.196	0.251	0.342	0.617	
Limbus-to-Limbus Distance (mm)						
Group 1	12.27±0.32	12.15±0.52	12.13±0.33	12.17±0.26	12.16±0.32	0.756
Group 2	11.98±0.49	11.65±0.56	11.87±0.47	11.96±0.49	11.10±0.48	**<0.001**
Group 3			11.96±0.44			
p	0.081	0.070	0.251	0.288	0.410	

Table 4. Pupillometry data of the participants

	Preoperative	1st week	1st month	3rd month	6th month	p
0 Candela/ m^2 (Luminance)						
Group 1	6.34±0.41	6.30±0.43	6.02±0.77	6.71±0.71	6.63±0.51	**0.005**
Group 2	6.40±0.65	6.29±0.74	6.29±0.65	6.08±0.79	6.22±0.64	0.538
Group 3			6.25±0.61			
p	0.704	0.751	0.343	0.062	0.164	
1 Candela/ m^2 (Luminance)						
Group 1	5.30±0.63	5.48±0.75	5.20±0.87	5.64±1.21	5.58±0.99	0.274
Group 2	5.50±0.76	5.34±0.85	5.25±1.01	4.84±0.88	5.20±0.90	0.095
Group 3			5.26±0.74			
p	0.498	0.429	0.353	0.144	0.803	
10 Candela/ m^2 (Luminance)						
Group 1	4.06±0.79	4.42±0.77	3.78±0.58	4.22±0.91	4.18±1.06	0.104
Group 2	4.25±0.83	4.08±0.84	3.97±0.75	3.78±0.87	3.98±0.79	0.236
Group 3			4.10±0.75			
p	0.779	0.167	0.364	0.357	0.831	
100 Candela/ m^2 (Luminance)						
Group 1	2.85±0.37	2.81±0.23	2.64±0.19	3.02±0.51	2.73±0.21	0.166
Group 2	2.87±0.43	2.77±0.34	2.70±0.29	2.71±0.41	2.80±0.59	0.638
Group 3			2.77±0.40			
p	0.634	0.323	0.503	0.259	0.882	
200 Candela/ m^2 (Luminance)						
Group 1	2.53±0.22	2.51±0.19	2.40±0.12	2.57±0.27	2.40±0.13	0.599
Group 2	2.55±0.35	2.48±0.24	2.43±0.19	2.40±0.19	2.48±0.40	0.170
Group 3			2.47±0.23			
p	0.664	0.401	0.846	0.236	0.913	

In a study by Denis and Toesca (11) evaluating endothelial cell density, pleomorphism, and polymegatism by non-contact specular microscopy in children undergoing strabismus surgery, it was revealed that strabismus surgery did not result in a significant decrease in endothelial cell number, but pleomorphism changes were seen in aggressive interventions.

Gusek-Schneider et al. (12) evaluated endothelial cell density in eyes in which strabismus surgery was performed and found no significant change in endothelial cell density when the preoperative and postoperative periods were compared.

In our study, no significant corneal endothelial cell change was detected in specular microscopy measurements before and after surgery in the patient group. However, in group 2, central corneal thickness increased in the early postoperative period. This increase disappeared in the sixth month after surgery and there was no statistically significant difference with the preoperative period. Therefore, although the effects of strabismus surgery on anatomical structures differ according to the periods, it is necessary to follow up to determine whether the changes detected are permanent or temporary and to avoid making decisions in the early period.

Emre et al. (13) evaluated the change in anterior segment parameters after horizontal strabismus surgery performed in 18 eyes of 12 patients. However, they did not find a statistically significant change between the preoperative and postoperative periods.

Noh et al. (5) investigated anterior segment parameters and refractive changes in eyes in which external rectus surgery was performed and reported statistically significant changes in spherical equivalent, mean keratometry values, corneal astigmatism, anterior chamber volume, central and peripheral anterior chamber depth values in the first week after surgery. In the first month after surgery, observed that the changes in other parameters except the spherical equivalent gradually decreased.

Hutcheson KA (14) mentioned the importance of factors related to suturing and muscle placement techniques during surgery in the case of postoperative astigmatism. He theorized that if a muscle is sutured too close to the limbus or tied by resection causing excessive tension, the corneal or scleral curvature may change.

The diopter and axis of corneal astigmatism appear to change in eyes undergoing strabismus surgery. In a study by Karakosta et al. (15), a mean astigmatism difference of 0.43 D was observed between the patient and control groups after surgery. Furthermore, a 0.50 D astigmatism change was found in both the lateral and medial rectus muscle groups. Therefore, these changes should be considered when planning surgery to prevent clinically insignificant astigmatism from becoming clinically significant.

In a study by Mezad-Kours et al. (16) in 31 eyes of 22 patients who underwent strabismus surgery in adulthood, a postoperative spherical equivalent myopic shift and a change in the direction of rule-compliant astigmatism were observed. The induced surgical refractive change was clinically significant (≥0.5 D) in 11 eyes of the 9 patients (40.9% of patients).

In our study, axial length measurements in group 1 and most of the parameters (AU, K1, K2, ACD, WWD) in group 2 were found to be significantly different in optical biometric measurements in the preoperative and postoperative period in the patient group. In accordance with the literature, anterior segment changes are observed in the postoperative period in patients undergoing both resection and recession surgery. One of the main anatomical goals of strabismus surgery is to achieve parallelism of the visual axes. Our surgeries should provide functional achievements as well as anatomical success. While evaluating the functional achievements, the effects of surgery should be considered and caution and caution should be taken about additional interventions and/or treatment recommendations to be made in the early period.

The small number of patients in our study is one of the main shortcomings. In addition, the inability to perform anterior segment angiography to objectively assess the effect on anterior segment circulation due to muscle intervention is another shortcoming. Since our institution did not have a corneal topography device during the study period, this aspect of the effects could not be evaluated. However, the prospective nature of our study is one of its strengths.

It is not known whether the results in future studies will be similar to the six-month measurement results in our study. Therefore, prospective studies with a larger number of cases, longer duration, and wider participation may contribute to obtaining more detailed results on this subject.

CONCLUSION

Strabismus surgery is effective on anterior segment parameters as well as correcting eye movements and visual axis. In the management of the patient in the postoperative period, the anterior segment should be carefully evaluated at each examination, the findings should be noted and the patients should be followed closely.

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