

The Effect of Age on Scleral Lens Fitting Characteristics

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INTRODUCTION

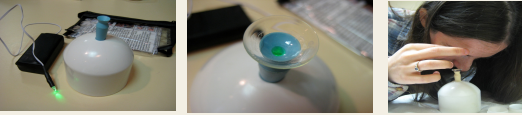
Scleral lenses have become a common treatment modality for individuals who suffer from decreased vision and ocular discomfort caused by irregular corneal surfaces and/or ocular surface diseases. Scleral lens wear however, requires more complex care and handling compared to the more widely available soft contact lenses. Often, specific tools are required for application and removal. Additionally, scleral lenses must be handled carefully and disinfected daily as they are not disposable. Due to the precision in handling and detailed disinfection protocols required for successful wear, practitioners must ensure that patients are able to fully handle these scleral lens procedures. Although scleral lenses have been described to be medically necessary for many conditions that may arise later in life, to our knowledge, patient age has not been evaluated in depth as a factor to scleral lens fitting and treatment finalization and/or success.

PURPOSE

To evaluate the effect of age, gender and diagnosis (irregular cornea versus ocular surface disease) on the number of follow up visits required to finalize a scleral lens (ScCL) fit, effect of age on training time for scleral lens handling proficiency, and effect of age on the need for aids to enhance scleral lens application.

METHODS

A retrospective study of 809 patients referred for ScCL treatment between September 1st, 2009 and November 30th, 2017 at the USC Roski Eye Institute. Patients who did not have a successful fit, previously wore a scleral lens, or whose data collection was hindered due to database technical difficulties were excluded from the study. 593 patients (312 female; 281 male) met our criteria (avg age 52.15 years +/- 16.71); their age, treatment indication, number of follow up visits, cumulative training time and additional aids (light, stand, human aid) required for lens application were evaluated.



Images left to right: Light, stand and plunger tools that are used to assist patients with application of ScCL; close up view of ScCL on light stand; patient self inserting a ScCL with the assistance of a light and stand.

RESULTS

Table 1: Characteristics of individuals with the diagnosis of Irregular Cornea

IRREGULAR CORNEA (IC) Diagnosis	n	Age Range	Avg Age	Avg #F/U	Female	Male	Aids	Avg A/R Time
PELLUCID MARGINAL DEGENERATION	7	28-63	50.29	2.86	3	4	0	31.43
CORNEAL SCAR	18	35-82	56.11	3.56	11	7	2	45.06
SALZMANN'S NODULAR DEGENERATION	8	40-74	56	3.75	7	1	2	46.88
CORNEAL ECTASIA	5	42-62	49.4	3.80	2	3	1	30
CORNEAL ECTASIA (S/P REFRACTIVE SURGERY)	24	34-65	53.04	3.83	9	15	0	38.13
ENDOTHELIAL CORNEAL DYSTROPHY	2	59-68	63.5	4.00	2	0	1	52.5
KERATOCONUS	104	15-70	37.57	4.03	35	69	10	40.19
CORNEAL SCAR (S/P REFRACTIVE SURGERY)	9	40-76	58	4.44	4	5	2	50
CORNEAL TRANSPLANT	84	22-91	58.81	4.63	43	41	18	50.14
CORNEAL SCAR (S/P TRAUMA)	6	50-73	61.17	4.67	1	5	2	49.17
CORNEAL DEGENERATION/DELLEN	1	N/A	76	5.00	0	1	0	120
REIS BUCKLER CORNEAL DYSTROPHY	1	N/A	56	6.00	0	1	0	40
Total	269	-	-	-	117	152	38	-
Average	-	-	56.32±19.14	4.21	-	-	-	49.46

Table 2: Characteristics of individuals with the diagnosis of Ocular Surface Disease

OCULAR SURFACE DISEASE (OSD) Diagnosis	n	Age Range	Avg Age	Avg #F/U	Female	Male	Aids	Avg A/R Time
DRY EYE SYNDROME (2/2 RA)	3	56-64	59.33	2.67	3	0	2	45
NEUTROTROPIC KERATOCONJUNCTIVITIS	9	21-93	57.78	3.11	5	4	3	42.78
EXPOSURE KERATOPATHY	22	9-89	60.82	3.86	17	5	8	54.64
APHAKIA	1	N/A	74	4.00	1	0	0	70
DRY EYE SYNDROME (S/P REFRACTIVE SURGERY)	8	42-70	63	4.00	8	0	0	51.88
MUCOUS MEMBRANE PEMPHIGOID	1	N/A	55	4.00	1	0	0	20
OCULAR CICATRICAL PEMPHIGOID	1	N/A	57	4.00	1	0	0	45
DRY EYE SYNDROME	85	11-84	52.79	4.09	58	27	23	44.94
GRAFT-VS-HOST DISEASE	105	20-78	54.6	4.15	41	64	22	54.37
DRY EYE SYNDROME (S/P CHEMO)	4	18-72	54.25	4.25	4	0	0	76.25
STEVENS-JOHNSON SYNDROME	21	18-66	40.90	4.52	9	12	4	62.62
KERATOCONJUNCTIVITIS SIGRENS'S	42	20-82	54.43	4.74	34	8	11	62.26
LIMBAL STEM CELL DEFICIENCY	21	36-84	59.19	4.81	12	9	4	45.95
ANIRIDIA	1	N/A	30	6.00	1	0	0	40
Total	324	-	-	-	195	129	67	-
Average	-	-	55.22±10.14	4.16	-	-	-	51.09

Figure 1: The average amount of training time (in minutes) increased as age increased.

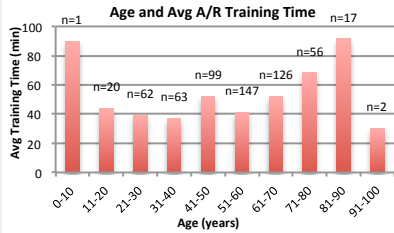
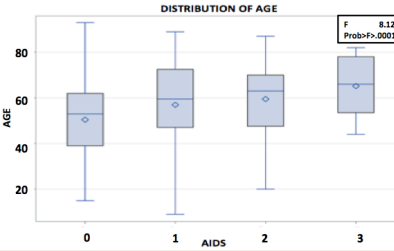


Figure 2: As patient age increased, the need for additional aids also increased, p-value <0.001.



DISCUSSION

- In our study, patients aged 9 to 93 were successfully fit with a ScCL. An F-statistic of 0.80 and an overall ANOVA p-value of 0.5501 does not show significant evidence to reject the null hypothesis. We cannot conclude that there is a significant difference in mean number of follow up visits across the groups of age. Therefore, **age does not have a significant effect on the number of follow up visits required to finalize the fit of a ScCL.**
- 45.87% of patients who were fit with a ScCL had the primary diagnosis of an IC and 54.13% had the primary diagnosis of an OSD. Patients suffering from an OSD and/or IC can benefit from wearing a scleral lens, however, **there was not enough evidence to conclude a relationship between diagnosis and the number of follow up visits required to complete a ScCL fit.**
- All the patients were evaluated by a single clinician and we should consider if the clinician's fitting skills improved over time, thus reducing the number of follow up visits required to complete a ScCL fit. There is a training period after which there is a reduction in both trial lenses needed and reorders performed to achieve the best scleral lens that subjects can comfortably wear successfully.¹ Rather than number of follow ups, the number of ScCL trials ordered prior to achieving an optimal fit may be considered.
- Age has a significant effect on training time**, though Pearson's correlation coefficient, $r=0.2688$, indicated a weak positive relationship, it is still significant due to a p-value <0.001. Age related limitations may be due to physical changes that accompany age, such as tremors or arthritis that lead to decreased dexterity.²
- An overall ANOVA p-value<0.001 and F-statistic=8.12 showed that **age does have a significant effect on the number of aids required to become proficient at ScCL application and removal.**
- The number of follow up visits do not significantly differ across the two gender groups. There is also no significant relationship between gender and follow up visits.**
- There is not a significant relationship between gender and number of aids required to become proficient at scleral lens application and removal.**
- Patient motivation may affect proficiency: I.E. a patient has a job and may be more inclined to complete a fitting sooner in order to continue performing activities of daily living. Furthermore, additional research may explore if a patient's motivation is self derived or prompted by a friend or family member.
- This retrospective analysis demonstrates the wide range of eye conditions that benefit from scleral lenses and also suggests that patients with a very wide range of ages (9-93, avg 52.15 +/- 16.71) can undergo a successful fitting.

CONCLUSION

Our study suggests that neither age nor gender affects the number of follow up visits required for scleral lens fit finalization. The relationship between diagnosis and follow up visits was indeterminate. However, older individuals required more training time for lens handling proficiency and were more likely to require the use of aids for scleral lens application.

ACKNOWLEDGEMENTS

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