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CORNEAL PARAMETERS IN RHEUMATOID ARTHRITIS PATIENTS

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ABSTRACT

Background: Individuals with rheumatoid arthritis (RA) have a decrease in corneal thickness (CT). However, there is no evidence in the literature on the assessment of keratometric values, CV (corneal volume), and anterior chamber parameters.

Aim: The purpose of this study was to assess corneal parameters in rheumatoid arthritis patients.

Methods: The study evaluated 128 rheumatoid arthritis patients, 64 of whom received biologics, 64 of whom received conventional medications, and 64 of whom were healthy controls. Corneal volume, corneal thickness from pupil center (CCT), apex (ACT), and thinnest point (TCT), as well as keratometry values (mean keratometry [Km], steep [K2], and anterior flat [K1]) were measured and compared between the groups.

Results: The RA group had significantly higher Km, K1, and K2 values (p=0.02, 0.04, and 0.01, respectively). Subjects with RA had significantly lower mean values of CV, TCT, ACT, and CCT (p=0.01, <0.001, <0.001, and <0.001, respectively). When RA participants were split into two therapy groups and compared to controls, there were significant differences in CV, TCT, ACT, CCT, and K1 (p=0.03, 0.001, 0.005, and 0.03, respectively). The RA-biologic group's CV and K1 values (p=0.125 and 0.203) were comparable to those of the controls.

Conclusions: The current study finds that biologic medicines improve keratometric values and corneal volume in rheumatoid arthritis patients.

Keywords: keratometry, rheumatoid arthritis, corneal thickness, corneal volume, and corneal parameters

INTRODUCTION

Rheumatoid arthritis, also known as RA, is a multisystemic, inflammatory, autoimmune disease that primarily affects synovial joints. Approximately 1% of people worldwide suffer with rheumatoid arthritis, which is almost three times more common in women than in men. Rheumatoid arthritis typically manifests between the ages of 40 and 50. In addition to the synovial joints, rheumatoid arthritis also affects the eyes, skin, kidneys, lungs, and heart. About 25% of individuals with rheumatoid arthritis have ocular involvement.[1]

The most frequent issue that arises from ocular surface involvement is dry eye. In addition to dry eyes, rheumatoid arthritis patients may also have retinal vasculitis, anterior uveitis, scleritis, episcleritis, and corneal inflammatory conditions such as corneal melting, peripheral ulcerative keratitis, sclerosing keratitis, and stromal keratitis.[2]

The stroma layer, which is made up of collagen fibers arranged in a regular pattern, is essential for corneal transparency, flexibility, and refractive power. The corneal stroma can be impacted by pathological illnesses including systemic connective tissue diseases, even if aging causes stromal alterations as a natural process. To determine the extent of ocular involvement in these conditions, it is essential to assess the corneal parameters.

According to reports, the most common autoimmune condition that harms the cornea is rheumatoid arthritis. Different types of autoimmune illnesses with corneal involvement can have different extracellular matrix involvement, corneal moisture levels, and types of impacted collagen.[3,4]

Evaluation of refractive problems, intraocular lens power, keratoconus follow-up, and glaucoma suspicion are all important aspects of corneal parameter assessment. There are few studies in the literature evaluating anterior chamber characteristics, CV (corneal volume), and keratometry values; nevertheless, a decrease in CT (corneal thickness) has been seen in people with rheumatoid arthritis.5

The current study focused on corneal parameters in rheumatoid arthritis patients, including anterior chamber measurements such as chamber angle (ACA), anterior chamber depth (ACD), and anterior chamber volume (ACV), as well as corneal parameters such as CV, CT (central, apex, thinnest), and keratometry.

MATERIALS AND METHODS

The current prospective clinical study focused on corneal parameters in individuals with rheumatoid arthritis, including corneal parameters like CV, CT (central, apex, thinnest), and keratometry, as well as anterior chamber measurements like chamber angle (ACA), anterior chamber depth (ACD), and anterior chamber volume (ACV). Following approval from the relevant institutional ethical committee, the study was conducted at...from...to... The Institute's Department of Ophthalmology provided the study participants. Prior to their involvement in the study, all participants provided written and verbal informed consent.

Rheumatoid arthritis patients who visited the Institute within the specified study period were included in the study. In this study, 128 participants were compared to 64 healthy, age-matched controls. The rheumatoid arthritis patients were then split into two groups based on the type of treatment they received. Group I consisted of 64 rheumatoid arthritis patients receiving biological DMARDs (disease-modifying anti-rheumatoid drugs), while Group II included 64 rheumatoid arthritis patients receiving conventional DMARDs.

The right eye of the participants was evaluated. ACR/EULAR (American College of Rheumatology/European League Against Rheumatism) 2010 criteria were applied for diagnosis. Contact lens users, use of topical medications other than artificial tears, history of ocular trauma or surgery, refractive errors more than ± 3.00 D, and any systemic or ophthalmic disease (apart from dry eye) were all excluded from the study.

The presence of dry eyes, the length of the sickness, the individuals' gender, and their age were all evaluated. Additionally, rheumatoid arthritis patients' DAS-28 (disease activity scores) were evaluated. C-reactive protein, patient global score, and 28 tender and swollen joint counts were used to calculate DAS-28 scores. Rheumatoid arthritis remission was indicated by scores of less than 2.6, mild disease activity was indicated by scores between 2.6 and 3.2, active disease was indicated by scores between 3.2 and 5.1, and extremely active disease was indicated by scores greater than 5.1.

A high-resolution imaging system was used to measure mean keratometry (Km), steep (K2), and anterior flat (K1). Chamber parameters such as ACA, ACD, ACV, CV, CT from pupil center (CCT), thinnest point (TCT), and apex (ACT) were also evaluated. Scheimpflug camera scans were carried out in the dark. According to QS (quality specification), the scans were deemed acceptable for analysis. All measurements were completed concurrently by the same individual who was blind to the groups. Data from individuals with rheumatoid arthritis and those in good health were compared.

The collected data was statistically examined using the chi-square test, one-way ANOVA (analysis of variance), and SPSS (Statistical Package for the Social Sciences) software version 24.0 (IBM Corp., Armonk, NY, USA). The mean, standard deviation, frequency, and percentages were used to express the results. A p-value of less than 0.05 was deemed statistically significant.

RESULTS

The current prospective clinical study focused on corneal parameters in individuals with rheumatoid arthritis, including corneal parameters like CV, CT (central, apex, thinnest), and keratometry, as well as anterior chamber measurements like chamber angle (ACA), anterior chamber depth (ACD), and anterior chamber volume (ACV). The study evaluated 128 rheumatoid arthritis patients, of whom 64 received biologic medications, 64 received conventional medications, and the remaining 64 were healthy controls. The RA group had a mean DAS-28 score of 3.32±1.31, a mean RA duration of 13.69±9.74 years, and 92/36 individuals had either absent or present dry eyes. There were 50/14 males/females in the controls and 110/18

males/females in the RA group, indicating statistical non-significance with p=0.336. With p=0.094, the study individuals' mean age was similar in RA and controls (Table 1).

According to the study's findings, dry eyes were observed in 46/18 people from Group I and Group II, respectively, with p=1.000 when comparing the demographic and illness characteristics of RA biologic and RA conventional subjects. Group I and Group II participants had mean DAS-28 values of 3.56±1.44 and 3.08±1.13, respectively, which were statistically not significant (p=0.203). Groups I and II had mean RA durations of 14.70±9.58 and 12.68±9.94 years, respectively, which were not statistically significant (p=0.11). In Group I, there were 50/14 males and females, while in Group II, there were 60/4 males and females, indicating statistical non-significance with p=0.073. With p=0.574, the average age of the research participants in Groups I and II was not statistically significant (Table 2).

Km was found to be statistically comparable in Groups I and II (p=0.06) and considerably greater in the RA group compared to controls (p=0.02) when comparing several corneal metrics in study participants. K1 was considerably greater in Group II compared to me (p=0.03) and in RA sufferers compared to controls (p=0.01). K2 indicated a non-significant difference in Groups I and II (p=0.101) and was considerably greater in RA groups than controls (p=0.04).

CV was substantially higher in Group I compared to Group II (p=0.03) and in controls compared to the RA group (p=0.01). TCT was considerably greater in Group I compared to Group II (p=0.001) and in controls compared to the RA group (p<0.001). ACT was considerably higher in Group I compared to Group II and in controls compared to the RA group (p<0.001 and 0.001, respectively). Additionally, CCT was considerably greater in Group I compared to Group II and in controls compared to RA (p<0.001 and 0.005). There was no statistically significant difference between Groups I and II, and ACA, ACD, and ACV were similar in RA and controls (Table 3).

When the post-hoc analysis findings were compared, CV was statistically non-significant in Group I-II (p=0.841), non-significant in Group I-control (p=0.125), and significant in Group II-control (p=0.03). TCT was significant in Group I and Group II controls (p=0.012 and 0.001), but statistically non-significant with p=0.777. Similar findings were observed for ACT, which was significant in Group I and Group II controls (p=0.014 and 0.001) but non-significant in Group I-control (p=0.611). CCT was significant in Group I and Group II controls (p=0.008 and 0.001), but non-significant in Group I-control (p=0.563). K1 was significant in Group II-control with p=0.02 and non-significant in Group I-II and Group I-control with p=0.614 and 0.203 (Table 4).

DISCUSSION

In this study, 128 rheumatoid arthritis patients were evaluated; 64 of them received biologic medications, 64 received conventional medications, and the remaining 64 were healthy controls. The RA group had a mean DAS-28 score of 3.32±1.31, a mean RA duration of 13.69±9.74 years, and 92/36 individuals had either absent or present dry eyes. There were 50/14 males/females in the controls and 110/18 males/females in the RA group, indicating statistical non-significance with p=0.336. With p=0.094, the study participants' mean ages in RA and controls were similar. These findings were similar to those of studies conducted in 2012 by Sedaghat MR et al.6 and in 2014 by Taş M et al.7, in which the authors evaluated participants with similar disease and demographic information.

When comparing the demographic and illness data of RA biologic and RA conventional participants, it was found that 46/18 subjects from Group I and Group II, respectively, had dry eyes (p=1.000). Group I and Group II participants had mean DAS-28 values of 3.56±1.44 and 3.08±1.13, respectively, which were statistically not significant (p=0.203). Groups I and II had mean RA durations of 14.70±9.58 and 12.68±9.94 years, respectively, which were not statistically significant (p=0.11).

In Group I, there were 50/14 males and females, while in Group II, there were 60/4 males and females, indicating statistical non-significance with p=0.073. With a p-value of 0.574, the average age of the research participants in Groups I and II was not statistically significant. These findings were in line with research by Can ME et al. (2015) and Gunes A et al. (2015), in which the authors compared the demographic and disease data of RA biologic and RA conventional patients therapy groups that were comparable to the current study.

According to the study's findings, Km was statistically comparable in Groups I and II (p=0.06) and considerably greater in the RA group as compared to controls (p=0.02). K1 was considerably greater in Group II compared to me (p=0.03) and in RA sufferers compared to controls (p=0.01). K2 indicated a non-significant difference in Groups I and II (p=0.101) and was considerably greater in RA groups than controls (p=0.04). CV was substantially higher in Group I compared to Group II (p=0.03) and in controls compared to the RA group (p=0.01).

TCT was considerably greater in Group I compared to Group II (p=0.001) and in controls compared to the RA group (p<0.001). ACT was considerably higher in Group I compared to Group II and in controls compared to the RA group (p<0.001 and 0.001, respectively). Additionally, CCT was considerably greater in Group I compared to Group II and in controls compared to RA (p<0.001 and 0.005). In RA and controls, ACA, ACD, and ACV were similar, and there was no statistically significant difference between Groups I and II.

The results of the current study were consistent with those of Özcura F et al. (2017) and Gurlevik U et al. (2018), who recommended comparing different corneal metrics in RA and control groups. When comparing the post-hoc analysis results, CV was statistically non-significant in Group I-II (p=0.841), non-significant in Group I-control (p=0.125), and significant in Group II-control (p=0.03). TCT was significant in Group I and Group II controls (p=0.012 and 0.001), but statistically non-significant with p=0.777.

Similar findings were observed for ACT, which was significant in Group I and Group II controls (p=0.014 and 0.001) but non-significant in Group I-control (p=0.611). CCT was significant in Group I and Group II controls (p=0.008 and 0.001), but non-significant in Group I-control (p=0.563). K1 was significant in Group II-control (p=0.02), but non-significant in Group I-II and Group I-control (p=0.614 and 0.203). These findings were consistent with those of Boote C et al. (2009) and Amador-Patarroyo MJ et al. (2018), whose authors reported findings that were comparable to the current investigation.

CONCLUSIONS

Considering its limitations, the present study concludes that biological agents lead to improvement in corneal volume and keratometry values in subjects with rheumatoid arthritis. However, further future longitudinal studies with larger sample sizes and longer monitoring periods are needed to reach a definitive conclusion.

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S. No	Parameters	RA group (n=128)	Controls (n=64)	p-value
1.	Dry eyes present/absent	92/36	-	-
2.	Mean DAS-28 scores	3.32±1.31	-	-
3.	Mean RA duration (years)	13.69±9.74	-	-
4.	Gender (males/females)	110/18	50/14	0.336
5.	Mean age (years)	57.57±9.28	54.01±10.66	0.094

Table 1: Demographic and disease data of control and RA subjects

S. No	Parameters	Group I (RA biologic) (n=64)	Group II (RA conventional) (n=64)	p-value
1.	Dry eyes present/absent	46/18	46/18	1.000
2.	Mean DAS-28 scores	3.56±1.44	3.08±1.13	0.203
3.	Mean RA duration	14.70±9.58	12.68±9.94	0.411
4.	Gender (males/females)	50/14	60/4	0.073
5.	Mean age (years)	58.23±9.42	56.91±9.22	0.574

Table 2: Comparison of demographic and disease data of RA biologic and RA conventional subjects

S. No		RA (n=64)	Controls (n=64)	p-value	Group I	Group II	p-value
1.	Km	44.47±1.82	43.62±1.53	**0.02**	44.29±1.63	44.66±2.00	0.062
2.	K1	44.03±1.73	43.11±1.49	**0.01**	43.83±1.49	45.23±1.94	**0.03**
3.	K2	44.91±2.02	44.13±1.63	**0.04**	44.72±1.84	44.10±2.13	0.101
4.	CV (mm3)	57.54±4.26	59.80±3.40	**0.01**	57.82±5.28	57.26±2.98	**0.03**
5.	TCT (µm)	513.54±31.62	540.70±34.33	**<0.001**	516.29±37.19	510.79±25.16	**0.001**
6.	ACT (µm)	520.50±29.85	547.14±34.02	**<0.001**	524.20±33.36	516.79±25.87	**0.001**
7.	CCT (µm)	519.23±32.63	546.39±34.14	**<0.001**	523.00±33.13	515.11±24.12	**0.005**
8.	ACA	34.48±6,96	36.21±7.71	0.268	35.86±7.71	33.09±5.93	0.167
9.	ACD (mm)	2.87±0.69	2.89±0.52	0.912	2.91±0.67	2.84±0.71	0.897
10.	ACV (mm3)	137.73±37.04	147.26±33.15	0.222	143.29±40.42	132.17±33.03	0.223

Table 3: Comparison of parameters in different study groups

S. No		Group I-II	Group I-control	Group II-control
1.	CV	0.841	**0.125**	**0.03**
2.	TCT	0.777	**0.012**	**0.001**
3.	ACT	0.611	**0.014**	**0.001**
4.	CCT	0.563	**0.008**	**0.001**
5.	K1	0.614	0.203	**0.02**

Table 4: comparison of results in post-hoc analysis