



## Original Research Article

## Evaluation of tear film in cases of rheumatoid arthritis

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## ARTICLE INFO

## Article history:

Received 19-02-2020

Accepted 28-03-2020

Available online 30-09-2020

## Keywords:

Dry eye

Disease activity

Rheumatoid Arthritis

Tear meniscus height

## ABSTRACT

**Purpose:** To evaluate the tear film and calculate the prevalence of dry eye in Rheumatoid Arthritis patients based on disease activity.

**Materials and Methods:** A cross-sectional study of 50 Rheumatoid Arthritis patients was performed in the Department of Ophthalmology, Smt. Kashibai Navale Medical College and Hospital, Pune. C-Reactive Protein (CRP), and Rheumatoid Factor (RF) labs were done. All patients underwent complete ophthalmic evaluation including assessment of visual acuity. Tear film assessment was done by calculating the Tear Meniscus Height (TMH) on Anterior Segment-Optical Coherence Tomography (AS-OCT).

**Results:** Fifty patients were studied. 44 were females and 6 were males with a mean age of  $47.34 \pm 10.33$  years. TMH was abnormal ( $\leq 300$  microns) in 31 (62%) patients. RF was positive in 31 (62%) patients while CRP was raised ( $>3.0$  mg/L) in 30 (60%) patients. RF Positivity had a significant correlation with abnormal TMH values ( $\chi^2 = 5.15, p=.02$ ). Raised CRP was not significantly associated with abnormal TMH values ( $\chi^2 = 0.39, p=.54$ ). Conclusion: Dry eye evaluation should be considered in RA patients irrespective of the disease activity.

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## 1. Introduction

Rheumatoid arthritis is a common systemic autoimmune disease which is characterized by persistent joint inflammation resulting in the loss of joint function and motility.<sup>1,2</sup> It is more common in women than in men. The disease activity can be assessed by using various methods like - C - Reactive Protein (CRP) and Rheumatoid Factor (RF) labs. The patients with positive RF in their blood work up are labelled as seropositive patients. The extra-articular manifestations involving multiple organs and of diverse severity are often seen in seropositive patients.<sup>3,4</sup> The ocular involvement is variable and may arise independently without any extra-articular manifestations. The common ocular findings are keratoconjunctivitis sicca (dry eye), episcleritis, anterior uveitis, necrotizing nodular scleritis and scleromalacia perforans.<sup>3</sup>

Dry eye syndrome also referred to secondary Sjögren's syndrome (SS), is the most common ophthalmic manifestation of RA. It presents as a burning/foreign body/gritty sensation or photophobia. The pathogenesis of dry eye in RA is still unclear, however, the most approved theory is that it results from immune-mediated destruction of the exocrine glands resulting in decreased tear production by the lacrimal glands.<sup>4</sup>

The tear meniscus is a reservoir of tear fluid containing 75% to 90% of the total tear volume.<sup>5</sup> Measurement of tear meniscus height (TMH) has proven informative for dry eye diagnosis,<sup>6</sup> showing a relatively high sensitivity and specificity.<sup>7</sup> TMH has shown good correlation with the symptoms and tear function tests such as the Schirmer test.<sup>8</sup> Several methods have been applied to measure TMH. TMH measured by OCT has been described as reliable for diagnosis of DED with high sensitivity and specificity.<sup>9</sup>

Understanding the correlation between RA disease activity with the ophthalmic manifestations may contribute to an early diagnosis in order to maintain a good visual

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outcome. Ocular manifestations in RA have been reported in previous studies,<sup>3,10</sup> however, studies examining the correlation between dry eye and RA disease activity.<sup>4</sup> Thus, this study was aimed at evaluating the correlation between RA disease activity and dry eye prevalence.

## 2. Materials and Methods

A cross-sectional observational study was conducted in the Department of Ophthalmology, Smt. Kashibai Navale Medical College and General Hospital, Pune. Fifty RA patients referred from the outpatient rheumatology clinic were included. Patients having other connective tissue diseases, autoimmune diseases, malignancy were excluded. In addition, patients having any active infection or allergy, abnormal lid movement, lid deformity and abnormal nasolacrimal drainage; contact lens wearers; patients using artificial tear drops; patients on any long-term systemic medication known to affect tear production; patients with history of any ocular surgery were excluded. After due ethical committee clearance, the study was conducted under the Tenets of Helsinki Declaration (2008) and after taking written informed consent from all the participants.

All patients underwent detailed history taking and medical evaluation. All patients were asked for symptoms of grittiness, redness, burning sensation and photophobia. Current medication use including Non-Steroid Anti-Inflammatory Drugs (NSAIDs), Disease Modifying Anti-Rheumatic Drugs (DMARDs) and corticosteroids were recorded. Laboratory investigations including CRP and RF were evaluated. CRP levels more than 3.0mg/L were considered as raised. The ophthalmic evaluation included best-corrected visual acuity (BCVA) by Snellen's chart. Slit-lamp examination and fundus examination were done after ocular surface assessment to avoid any possible confounding effect of topical mydriatic/cycloplegic topical medication on the ocular surface.

The aim of this study was to present the frequency of ocular surface manifestations in RA patients and to determine its relation with disease activity and duration.

### 2.1. Statistical analysis

Statistical analysis was carried out by the Statistical Package for Social Science (SPSS) version 20 (SPSS Inc., Chicago, Illinois, USA). Quantitative data were presented as mean and standard deviation while qualitative data as number and percentages. Chi-square test was used to evaluate the significance of correlation between the prevalence of dry eye and disease activity.

## 3. Results

Of the 50 patients of RA evaluated, 44 (83%) were females and 6 (17%) were males. The mean age of patients was  $47.34 \pm 10.33$  years (26–68 years) and the disease duration

was  $8.96 \pm 3.27$  years (3–15 years) as shown in Table 1.

On subjective evaluation, maximum patients reported burning sensation (60%); followed by grittiness (54%), redness (42%) and photophobia (30%) in decreasing frequency as shown in Table 2.

The laboratory evaluation of 50 patients showed 60% patients had Raised CRP levels, 62% were RF Positive. The TMH on calculation was found abnormal ( $\leq 300$  microns) in 62% patients as shown in Table 3.

As shown in Table 4, on comparing the TMH values with the RF results, it was found that the calculated p value is .02 (i.e.  $p < .05$ ) is significant.

As shown in Table 5, on comparing the TMH values with the CRP results, it was found that the calculated p value is .54 (i.e.  $p > .05$ ) is not significant.

**Table 1:**

Variables	RA patients
Age (years)	$47.34 \pm 10.33$ (26 - 68)
Female:Male	44/6 (7.3:1)

**Table 2:**

Symptoms Evaluation	No. of patients (Percentage)
Grittiness	27 (54%)
Redness	21 (42%)
Burning sensation	30 (60%)
Photophobia	15 (30%)

**Table 3:**

Test	No. of patients (Percentage)
CRP Raised ( $>3.0$ mg/L)	30 (60%)
RF Positive	31 (62%)
TMH Decreased ( $\leq 300$ microns)	31 (62%)

**Table 4:**

Tear Meniscus Height (TMH)	Rheumatoid Factor (RF)		Total
	Positive	Negative	
$>300$ microns	23	8	31
$\leq 300$ microns	8	11	19
<b>Total</b>	31	19	50

Chi-square statistic = 5.15 p value = .02 (i.e.  $p < .05$ )

## 4. Discussion

Rheumatoid arthritis is a well-known chronic systemic autoimmune disease of an unknown etiology that characteristically presents with symmetrical inflammatory polyarthritis and systemic manifestations. RA has numerous extra-articular manifestations which can involve the cardiac,

**Table 5:**

Tear Meniscus Height (TMH)	C – Reactive Protein (CRP)		Total
	Positive	Negative	
>300 microns	20	11	31
≤ 300 microns	10	8	19
<b>Total</b>	30	20	50

Chi-square statistic = 0.39 p value = .54 (i.e. p >.05)



**Fig. 1:** TMH measurement using AS-OCT

renal, pulmonary and ocular systems.<sup>11,12</sup> Although timely diagnosis and newer treatment modalities have led to a reduction in the severity of ocular complications, ocular involvement in RA is still a cause of significant morbidity in these patients.<sup>3</sup> The histologic similarity of joints, sclera and cornea likely accounts for many of the ocular manifestations of RA since all three structures contain collagen and proteoglycans. The association of ocular conditions and RA is majorly attributed to an immune-based mechanism by many theories. The normal tear film has antimicrobial properties and contains immunomodulatory factors such as collagenase inhibitors, therefore a defective tear film can lead to serious ocular surface complications. Immune complex deposition, secretion of collagenases by macrophages and neutrophils, cytokine production, complement activation, and formation of autoantibodies play a role in the process.<sup>13</sup>

In the present study, dry eye was found to be present in 62% patients. This finding is similar to the study conducted by ZH Eldaly et al<sup>14</sup> here a prevalence of 54.7% was reported. While it is different from the study conducted by JW Yumori et al<sup>15</sup> where a prevalence of 95.16% was reported. Treatment modalities for dry eye include topical lubricating agents and adding DMARDs in the treatment regimen of RA. Rarely, to resolve severe keratoconjunctivitis using a biological therapy such as monoclonal antibody to tumour necrosis factor- $\alpha$  as infliximab may be warranted.

The present study found a significant correlation between RF positivity and dry eye occurrence. These findings are consistent with previous studies conducted by.<sup>12,16</sup> However, other studies contradicted the present study by not

finding any correlation between RF and dry eye.<sup>17,18</sup>

The present study found no significant correlation between CRP levels and dry eye. This is similar to studies conducted previously which did not find any significant correlation between CRP and dry eye.<sup>15,17</sup> Thus, the combination of RF and CRP can help in early detection of ocular manifestation in the form of dry eye in RA patients.

In conclusion, there is varied correlation of dry eye and serum disease activity markers. Thus, ocular involvement must be considered in all RA cases and the treating rheumatologists should advice an ocular examination for all patients at the time of diagnosis and with periodic follow ups for early detection of ocular involvement. The early diagnosis will help in early establishment of appropriate local and systemic therapy and thus help in better overall management of the patient. Hence, a multidisciplinary team including rheumatologist and ophthalmologist is needed for proper management and improved lifestyle of RA patients.

## 5. Source of Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

## 6. Declaration of Competing Interest

None.

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**Cite this article:** Shah K, Murkey V, Halikar S. Evaluation of tear film in cases of rheumatoid arthritis. *Indian J Clin Exp Ophthalmol* 2020;6(3):348-351.