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PARAMETERS OF IMMUNOBIOCHEMICAL MARKERS, C-REACTIVE PROTEIN, INTERLEUKINS (IL-6, IL-1B) AND TNF-A IN BLOOD SERUM AND TEAR FLUID IN PATIENTS WITH COMPLICATED CATARACT IN RHEUMATOID ARTHRITIS

G. E. Tulakova
Assistant of the Department of Ophthalmology, Samarkand State Medical University

Sh. Sh. Baylatova
Independent candidate of the Department of Ophthalmology, Samarkand State Medical University

Abstract: Relevance: Rheumatoid arthritis (RA) is a chronic inflammatory disease frequently associated with systemic complications, including eye damage.

Materials and Methods: The study involved 60 patients diagnosed with cataracts complicated by rheumatoid arthritis. The control group comprised 30 healthy individuals without signs of cataracts or inflammatory diseases. Blood serum and tear fluid samples were collected from all participants to analyze the concentrations of CRP, IL-6, IL-1β, and TNF-α.

Results: CRP levels were significantly elevated in the blood serum and tear fluid of patients with RA and cataracts compared to the control group ($p < 0.01$).

Keywords: C-reactive protein, interleukins (IL-6, IL-1β) and TNF-α, Rheumatoid arthritis.

For citation:

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Introduction

Cataract in patients with rheumatoid arthritis occurs in a significant percentage of cases and requires a special approach to surgical treatment [1,2]. Despite the development of high-tech surgical methods, such patients often remain without surgical assistance due to the risk of disease recurrence and the difficulty of postoperative control of the inflammatory process [5,6]. Investigating the role of immunobiochemical markers, such as C-reactive protein, interleukins (IL-6, IL-1β) and TNF-α in blood serum and tear fluid of patients with complicated cataract in rheumatoid arthritis, reveals their significance in the pathogenesis of both diseases. Elevated levels of these markers indicate active inflammation and immune-mediated processes that contribute to both the development of rheumatoid arthritis and complicated cataract [1,7,9,11]. C-reactive protein, as a marker of acute inflammation, correlates with disease activity and can serve as an indicator of severity. Interleukins IL-6 and IL-1β, as well as TNF-α, play a key role in the mediator processes of inflammation, confirming their importance in monitoring and potential therapy of these conditions [3,4,6]. Therefore, monitoring these markers in blood serum and tear fluid is an important

tool for assessing disease activity, prognosis, and treatment effectiveness in patients with rheumatoid arthritis and complicated cataract.

Challenges associated with cataract surgery in patients with rheumatoid arthritis highlight the need for further research and the development of optimal management strategies for these patients [8,9,10,11]. This includes a deeper understanding of the pathogenesis of the disease, improving preoperative preparation methods, choosing individualized approaches to surgery, and postoperative management. Understanding these aspects will help improve surgical outcomes and improve the quality of life of patients with rheumatoid arthritis [3,4,5,6].

The aim of this study is to examine the parameters of these markers in the blood serum and tear fluid of patients with complicated cataract in RA.

Materials and Methods

The study included 75 patients diagnosed with cataracts complicated by rheumatoid arthritis. The control group consisted of 30 healthy individuals without signs of cataracts and inflammatory diseases. Blood serum and tear fluid samples were collected from all participants to analyze the concentrations of CRP, IL-6, IL-1β and TNF-α as presented in Table 1.

Table 1. Clinical Characteristics of Patients with RA.

Evaluation results of C-reactive protein, interleukins (IL-6, IL-1β), and TNF-α levels in blood of patients with rheumatoid arthritis (RA) against their clinical indicators.

Parameter	Main Group 1 (n=38)	Main Group 1 (n=38)	Main Group 1 (n=38)
	M±m	M±m	M±m
C-reactive protein, mol/ml	2,81±0,38	3,48±0,31^*	2,51±0,52
Interleukins (IL-6, IL-1β) and TNF-α, ng/ml	625±312	712±244	498±245
Clinical indicators			
Phases of RA			
1 **phase**	-	-	30 (100%)
2 **phase**	12 (40%)	6 (20%)	-
3 **phase**	18 (60%)	24 (80%)	-
Severity grades of RA			
Stage 1	10 (33,3%)	3 (10%)	21 (70%)
Stage 2	13 (43,3%)	16 (53,3%)	9 (30%)
Stage 3	7 (23,3%)	11 (36,7%)	-
Medication intake			
1 **Medication**	3 (10%)	2 (6,7%)	24 (80%)
2 **Medication**	18 (60%)	16 (53,3%)	6 (20%)
3 **And more**	9 (30%)	12 (40%)	

- Statistically significant compared to the control group 1 with $p < 0.05$; ^ - Statistically significant compared to the control group 2 with $p < 0.05$

Results

The results showed that patients with rheumatoid arthritis (RA) complicated by ophthalmological manifestations exhibited significant changes in the levels of C-reactive protein (CRP), interleukins (IL-6,

IL-1β), and TNF-α in both blood and tear fluid. Increased levels of CRP, IL-6, IL-1β, and TNF-α in the blood are associated with the progression of the general pathological process in RA. In tear fluid, these markers are associated with the worsening severity of ophthalmological manifestations of RA, which is confirmed by the results of the correlation analysis.

It is important to note that a significant increase in the levels of CRP, IL-6, IL-1β, and TNF-α in tear fluid was found in patients of the control group 1, who had RA of the 1st degree of severity but did not have clear ophthalmoscopic signs of the disease. This indicates that, along with deep structural changes at the choroid level and microcirculatory disorders identified using OCTA, an increase in the levels of these markers can be considered an indicator or predictor of the onset of pathological changes in the vascular membrane of the eyeball in RA. The results also confirm the role of inflammatory markers in the early stages of ophthalmological manifestations of RA.

The assessment of CRP, IL-6, IL-1β, and TNF-α levels in biological fluids showed that their role is significant, especially in more pronounced complications of RA. The most pronounced correlations with clinical indicators were found in the main group 2 in patients with more pronounced RA complications. This may be due to the fact that at these stages, inflammatory processes play a more significant role in the development of dry keratoconjunctivitis and optic neuropathy, which are characteristic of RA.

Discussion

Based on the obtained results and analysis of the existing literature, a concept of the pathogenesis of the development of ophthalmological manifestations of RA under the influence of elevated levels of CRP, IL-6, IL-1β and TNF-α was formulated. According to the developed concept, under the influence of systemic inflammation, primary endothelial dysfunction develops, leading to a decrease in the production of nitric oxide (NO) and an increase in the production of a number of inflammatory markers, including CRP, IL-6, IL-1β and TNF-α. Elevated levels of these markers contribute to vasoconstriction of the choroid vessels, leading to stagnation in its microcirculatory bed and ischemia. As a result, choroid vessel thickening occurs, which can be determined using OCTA.

Conclusion

The results showed that patients with rheumatoid arthritis (RA) complicated by ophthalmological manifestations exhibited significant changes in the levels of C-reactive protein (CRP), interleukins (IL-6, IL-1β), and TNF-α in both blood and tear fluid. Increased levels of CRP, IL-6, IL-1β, and TNF-α in the blood are associated with the progression of the general pathological process in RA. In tear fluid, these markers are associated with the worsening severity of ophthalmological manifestations of RA, which is confirmed by the results of the correlation analysis.

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