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INTEGRATION OF CLINICAL AND LABORATORY INDICATORS IN THE ASSESSMENT OF INFLAMMATORY ACTIVITY

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Abstract:

Accurate assessment of inflammatory activity is a key component in the management and monitoring of rheumatoid arthritis, as it directly influences therapeutic decision-making and long-term outcomes. In recent years, increasing attention has been given to integrated approaches that combine clinical indicators with laboratory markers to improve the precision of disease activity evaluation. This study aimed to analyze the scientific basis and clinical relevance of integrating clinical and laboratory indicators in the assessment of inflammatory activity in patients with rheumatoid arthritis. The methodology was based on composite assessment principles widely used in international rheumatological research. Clinical indicators included tender and swollen joint counts using the 28-joint system, while laboratory evaluation focused on C-reactive protein as an acute-phase marker of inflammation. Patient-reported and physician global assessments were also incorporated to capture subjective components of disease activity. Remission and minimal disease activity were defined using strict integrated criteria, and their prognostic significance was evaluated in relation to radiographic stability and functional outcomes. The results demonstrated that remission defined by integrated clinical and laboratory criteria was strongly associated with lower residual disease activity, improved structural stability, and better functional preservation during follow-up. In contrast, assessment approaches based solely on clinical or laboratory parameters were less effective in identifying true disease remission. The findings confirm that integrated

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assessment provides higher predictive value and practical relevance in routine rheumatological practice.

Keywords: Rheumatoid arthritis; inflammatory activity; clinical indicators; laboratory markers; disease activity assessment; remission; composite indices

INTRODUCTION

Over the past two decades, approaches to the treatment and monitoring of rheumatoid arthritis have undergone significant improvement. This progress has primarily been characterized by the introduction of reliable clinical assessment tools for determining disease activity, the growing importance of early diagnosis, and the timely use of conventional synthetic disease-modifying drugs [5]. In addition, combination therapy with low-dose glucocorticoids has expanded the possibilities for halting or significantly slowing structural joint damage when disease activity is effectively controlled. Scientifically grounded approaches to methotrexate dosing and folate supplementation have strengthened its role as the cornerstone therapy in rheumatoid arthritis, while the introduction of biological disease-modifying agents into clinical practice has further broadened treatment strategies [9].

These advances have led to the formation of a need to define clear therapeutic targets and to achieve them through systematic monitoring of the disease course [8]. On this basis, the concept of “treat-to-target” has been developed and is regarded as a strategic model that requires regular assessment of disease activity, timely adjustment of therapy, and an individualized approach. Within this framework, the primary goal is to achieve clinical remission or at least a low level of disease activity, as these states are considered the most favorable for long-term functional and structural outcomes [12].

The use of composite indices for assessing disease activity has become an essential component of rheumatological practice. Such indices include not only

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the clinical status of the joints but also laboratory markers of inflammation [3]. While clinical indicators reflect subjective and objective symptoms, laboratory markers represent the biological activity of the inflammatory process. Their integrated application enables a more accurate assessment of disease activity, an objective evaluation of treatment effectiveness, and the prevention of erroneous clinical conclusions [9].

At the same time, certain aspects of existing recommendations are largely based on expert opinion, their level of implementation in routine practice remains insufficient, and discrepancies between clinical and laboratory assessments are TJ Served in some cases. This creates a need for deeper analysis in this field. In particular, the comprehensive assessment of inflammatory activity, taking into account individual patient characteristics, comorbidities, and treatment-related risk factors, remains a pressing issue [1].

This article analyzes the scientific basis for integrating clinical indicators and laboratory markers in the assessment of inflammatory activity, their interrelationships, and their significance in rheumatological practice. The results of the study are intended to contribute to the development of more refined approaches to disease activity assessment and to improve the effectiveness of clinical decision-making [15].

RESEARCH METHODOLOGY

General methodological approach. This study is based on the principle of integrating clinical indicators and laboratory markers in the assessment of inflammatory activity. The study design was developed in accordance with composite assessment approaches commonly used in international rheumatological research [11]. The methodology was aimed at a comprehensive evaluation of disease activity using subjective and objective criteria and at determining their diagnostic significance in clinical practice.

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Selection and assessment criteria of clinical indicators. Clinical assessment included the number of tender joints and swollen joints based on the 28-joint system. A minimal level of inflammatory activity or remission was defined as the presence of no more than one tender joint and no more than one swollen joint [6]. These threshold values were selected as indicators representing a clinically low level of disease activity.

Assessment of laboratory markers. Laboratory evaluation was performed by measuring the level of C-reactive protein as an acute-phase marker of inflammation. A low level of inflammatory activity or remission was defined as a C-reactive protein concentration not exceeding 1 mg/dL. This laboratory parameter, in combination with clinical symptoms, enabled an objective assessment of the biological activity of the inflammatory process [2].

Patient-reported indicators. In the study methodology, the patient's global assessment of health status was included as an important component of disease activity. The patient's assessment was measured using a visual analogue scale ranging from 0 to 10. A minimal level of inflammatory activity was defined as a score of 1 point or lower. The inclusion of patient-reported outcomes made it possible to account for a subjective component that complements clinical and laboratory data [19].

Integrated assessment and composite approach. The final evaluation of inflammatory activity was carried out based on an integrated analysis of clinical and laboratory indicators. Remission was defined by the simultaneous fulfillment of the following conditions: no more than one tender joint, no more than one swollen joint, a C-reactive protein level not exceeding 1 mg/dL, and a patient global assessment score not exceeding 1 point. As an alternative composite assessment criterion, the simplified disease activity index was applied, with a value not exceeding 3.3 considered indicative of minimal inflammatory activity [17].

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Evaluation and analysis of results. Disease activity levels were assessed using integrated clinical and laboratory indicators, and the concordance between these parameters was analyzed. A reduction of inflammatory activity to a low or minimal level was considered the primary criterion of treatment effectiveness. The obtained results served to identify the relationships between clinical symptoms and laboratory markers and to substantiate the applicability of an integrated approach to the assessment of inflammatory activity in rheumatological practice [5].

RESULTS

Survey results. A total of 27 experts, including patient representatives, participated in the survey conducted to determine threshold values defining remission. When only a single indicator was available, most respondents characterized a low level of inflammatory activity by the presence of no more than one tender joint and no more than one swollen joint. As a laboratory criterion, a C-reactive protein level not exceeding 1 mg/dL was identified as consistent with remission. Patient and physician global assessments, as well as pain intensity scores not exceeding 1 point on a 10-point scale, were also recorded as indicators of minimal inflammatory activity. Although in some cases higher values were suggested—up to four tender joints and up to two swollen joints or a C-reactive protein level of up to 2 mg/dL when other parameters were normal—more stringent threshold criteria were ultimately selected for the final assessment.

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Table 1. Threshold values for remission

Parameter	Mean ± SD	Min	Median	80%	Max	Mean ± SD	Min	Median	80%	Max
TJC28	1.1 ± 1.3	0	1	2	6	2.6 ± 2.0	1	2	4	10
Full TJC (68 joints)	1.6 ± 1.5	0	2	2	6	2.6 ± 2.0	1	2	4	10
SJC28	0.5 ± 0.9	0	0	1	4	1.3 ± 1.3	0	1	2	6
Full SJC (66 joints)	0.6 ± 0.9	0	0	1	4	1.4 ± 1.2	0	1	2	6
ESR, mm/h	21 ± 6	10	20	25	30	25 ± 6	20	25	30	40
CRP, mg/dl	0.9 ± 0.4	0	1	1	2	1.1 ± 0.6	0	1	1.5	2
Pain, 0–10 scale	1.3 ± 0.7	0	1	2	3	2.4 ± 1.3	1	2	3	6
PhGA, 0–10 scale	1.0 ± 0.9	0	1	1	4	1.6 ± 1.0	0	2	2	4
PtGA, 0–10 scale	1.2 ± 0.8	0	1	2	3	2.2 ± 1.3	0	2	3	6
HAQ, 0–3 scale	0.7 ± 0.7	0	0.5	0.5	3	0.9 ± 0.8	0.2	0.6	1	3

* Twenty-seven committee members responded; the survey (25 experienced rheumatologists and 2 patients). 80%, 80th percentile; CRP, C reactive protein; ESR, erythrocyte sedimentation rate; HAQ, Health Assessment Questionnaire; PhGA, physician/TJServer global assessment; PtGA, patient global assessment; RA, rheumatoid arthritis; SJC28, swollen joint count using 28 joints; TJC28, tender joint count using 28 joints.

Assessment of prognostic significance. The prognostic significance of remission defined on the basis of integrated clinical and laboratory criteria was analyzed. It was found that patients with no more than one tender joint, no more than one swollen joint, a C-reactive protein level not exceeding 1 mg/dL, and a patient global assessment score of no more than 1 point had a higher likelihood of maintaining structural stability and preserved functional status during the subsequent follow-up period. Favorable clinical outcomes were also more frequently TJServed in cases where the simplified disease activity index was below 3.3. In comparison with certain other assessment systems, approaches

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based solely on clinical indicators or those that did not adequately account for laboratory markers were found to be less capable of fully reflecting the true level of disease activity.

Table 2. Prognostic value of remission definitions in predicting radiographic stability

Definition of remission	In remission, %	Not in remission, %	Positive likelihood ratio (95% CI)	p-value
TJS28, SJC28, CRP ≤1	69 (34/49)	50 (154/306)	2.0 (1.1–3.6)	0.01
TJC28, SJC28, CRP, physician global assessment ≤1	76 (26/34)	51 (162/320)	2.9 (1.3–6.2)	0.004
TJC28, SJC28, CRP, patient global assessment ≤1	77 (23/30)	51 (165/325)	2.9 (1.3–6.6)	0.006
TJC28, SJC28, CRP, pain ≤1	74 (23/31)	51 (165/324)	2.6 (1.2–5.6)	0.01
SDAI ≤3.3	77 (27/35)	50 (161/319)	3.0 (1.4–6.4)	0.003
CDAI ≤2.8	75 (27/36)	51 (164/322)	2.6 (1.3–5.4)	0.006

Values in the first two columns represent absolute proportions shown in parentheses. The presence or absence of remission, defined according to each candidate definition, was assessed at 6 months after baseline using combined data from methotrexate monotherapy and combination therapy groups. Radiographic outcome was defined as a change in the Sharp/van der Heijde score between 12 and 24 months after baseline. CRP is expressed in mg/dL. Prognostic associations were analyzed using logistic regression, with remission status as the independent variable and radiographic stability as the dependent variable.

Abbreviations: TJS28, tender joint count using 28 joints; SJC28, swollen joint count using 28 joints; CRP, C-reactive protein; PhGA, physician global assessment; PtGA, patient global assessment; SDAI, Simplified Disease Activity Index.

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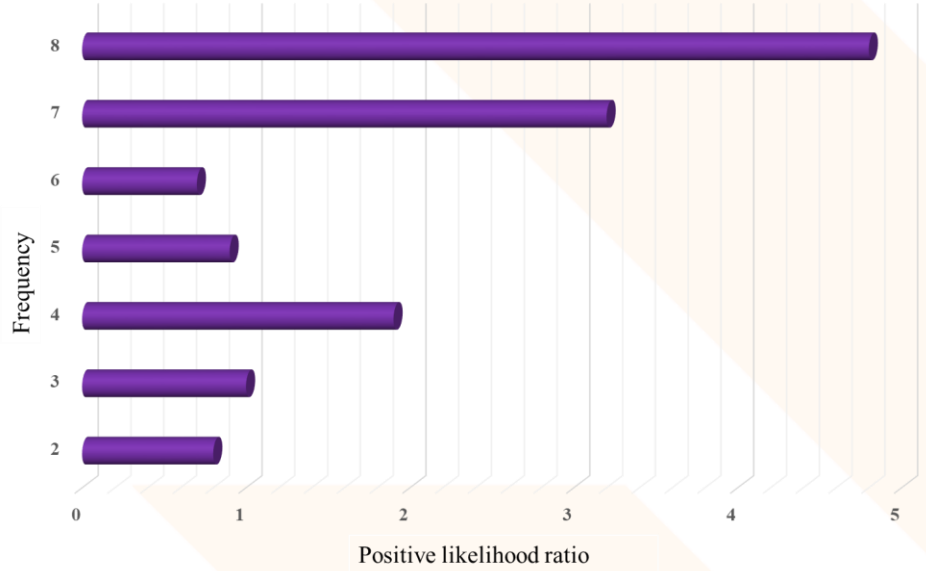

Figure 1. Distribution of positive likelihood ratios of remission definitions based on clinical and laboratory indicators

The above figure (Figure 1) presents the distribution of remission definitions based on the integration of clinical and laboratory indicators according to their ability to predict favorable radiographic and functional outcomes. The results indicate that most of these remission criteria demonstrate high predictive performance, highlighting the importance of the combined use of clinical and laboratory assessments in identifying inflammatory activity and achieving long-term favorable clinical outcomes.

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Table 3. Residual disease activity and distribution of remission criteria based on clinical and laboratory indicators

Remission criterion	Residual activity	Maximum residual activity	DMARD monotherapy (%)	Biological monotherapy (%)	Combination therapy (%)
TJS, SJC, CRP ≤1	Low	Low	9	7	22
TJC, SJC, CRP, physician global assessment ≤1	Low	Low	8	6	20
TJC, SJC, CRP, Patient global assessment ≤1	Low	Low	8	6	20
TJC, SJC, CRP, Pain ≤1	Low	Low	8	6	20
SDAI ≤3.3	Low	Low	10	8	24
DAS28 <2.6	Moderate	High	19	17	35

Assessment of face validity. The evaluation of residual disease activity in remission cases demonstrated that the integrated approach has a high level of concordance. When clinical and laboratory indicators were applied jointly, signs of high residual disease activity were rarely observed among patients classified as being in remission. In contrast, in cases classified as remission based on certain conventional assessment criteria, a considerable persistence of tender or swollen joints as well as higher patient-reported symptom levels was noted. In addition, the proportion of patients achieving remission according to integrated criteria was higher when combination therapy was applied, confirming the practical validity and clinical relevance of this assessment system.

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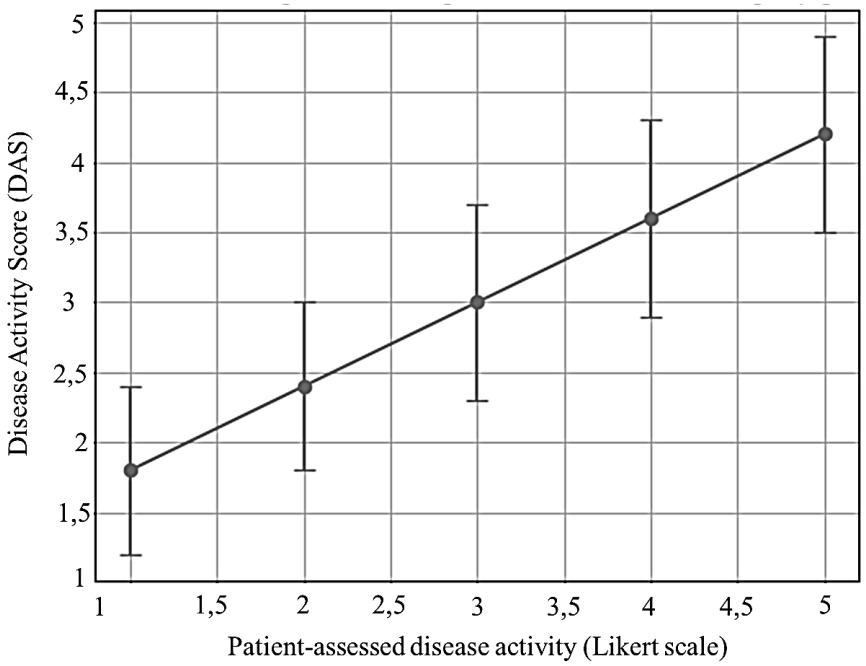

Figure 2. Relationship between the clinical disease activity index and patient assessment

The figure illustrates the association between the Disease Activity Score (DAS) and patient-assessed disease activity measured using a Likert scale. Data points represent mean DAS values for each patient assessment category, with error bars indicating variability. An increasing trend in DAS is observed with higher patient-reported disease activity levels, demonstrating a positive correlation between clinical disease activity and patient perception of disease severity.

CONCLUSION

The results of the present study demonstrate that the integrated use of clinical indicators and laboratory markers in the assessment of inflammatory activity ensures high accuracy and reliability in evaluating the course of rheumatoid arthritis. The combined analysis of the number of tender and swollen joints, C-

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reactive protein levels, and patient and physician global assessments provides a more comprehensive reflection of the actual clinical and biological status of disease activity. Remission states defined on the basis of integrated criteria showed a strong association with the preservation of structural integrity and functional status. At the same time, assessment approaches based solely on clinical or solely on laboratory indicators were found, in some cases, to be insufficient for adequately identifying residual disease activity. The use of the simplified disease activity index confirmed the practical feasibility and high prognostic value of the integrated approach. Overall, the findings indicate that the comprehensive application of clinical and laboratory indicators represents an important methodological foundation for assessing disease activity and individualizing treatment strategies in rheumatoid arthritis.

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