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Review Article

Assessment of disease activity and quality of life of Korean patients with rheumatoid arthritis

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The management of rheumatoid arthritis (RA) follows a treat-to-target approach, as recommended by guidelines from the American College of Rheumatology (ACR) and the European League Against Rheumatism (EULAR). RA treatment recommendations include an emphasis on frequent disease activity assessments to optimize therapy, recognizing the possibility of timely therapies to slow progression and improve long-term results. The evaluation of joint inflammation, pain, physical function, and clinical indicators is required for comprehensive RA therapy. Current therapeutic goals include achieving low disease activity or remission to enhance the quality of life (QoL) for patients. ACR-endorsed RA disease activity measures, such as the Disease Activity Score in 28 Joints with erythrocyte sedimentation rate or C-reactive protein level, Simplified Disease Activity Index (SDAI), Clinical Disease Activity Index (CDAI), Patient Activity Scale-II, and Routine Assessment of Patient Index Data 3, are recommended for their precision and sensitivity in supporting treat-to-target strategies. The ACR and EULAR have implemented Boolean-based and index-based remission criteria (SDAI and CDAI, respectively) to evaluate therapeutic effectiveness. The use of these markers regularly aligns with the ACR guidelines, improving adherence to quality indicators in clinical practice and confirming the provision of high-quality RA therapy. This review examines disease activity, function, and QoL measurements in line with the ACR and EULAR guidelines to aid doctors in treating Korean patients with RA.

Keywords: Rheumatoid arthritis, Disease severity, Quality of life

INTRODUCTION

Rheumatoid arthritis (RA) is an inflammatory joint disease leading to structural joint damage, immobility, and changes in quality of life (QoL) [1]. The guidelines from the American College of Rheumatology (ACR) and the European League Against Rheumatism (EULAR) were developed to guide physicians in clinical decision-making [2,3]. The treat-to-target strategy was endorsed by the 2015 ACR RA Treatment Guidelines [4]. To comply with these guidelines, frequent RA disease activity evaluations must be performed as part of the standard treatment. Effective and prompt therapy has the potential to reduce disease activity and progression and improve long-term outcomes. Effective RA therapy requires a thorough evaluation of disease activity, which includes measurement of joint inflammation, pain, physical function, and various other clinical markers [2,3]. In this review, we aim to present assessment options for disease activity, function, and QoL in RA patients that can be utilized in clinical practice in Korea, focusing on the ACR and EULAR recommendations [5]. We outline measures for evaluating disease activity, function, and QoL to ensure optimal disease management.

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RECOMMENDATIONS

Every RA treatment should aim for remission or low disease activity (LDA) [2,3]. This fundamental concept aligns with the ACR's treat-to-target guidelines. Both the ACR and EULAR have adopted Boolean-based and index-based remission definition (Table 1) [2,3]. Treatment options should be reassessed within 3 months based on the effectiveness and tolerability of disease-modifying antirheumatic drugs (DMARDs) [3]. Disease activity levels are evaluated using ACR-endorsed RA disease activity measurements or other validated composite measures (Table 2) [2,3,5]. In cases of active disease, regular monitoring should occur every 1 to 3 months [3]. If no improvement is observed 3 months after starting treatment or if the goal is not met within 6 months, therapeutic adjustments are necessary [2,3].

Table 1. ACR/EULAR definitions of remission in rheumatoid arthritis

Boolean-based definition	Index-based definition
Tender joint count ≤1*	SDAI ≤3.3
Swollen joint count ≤1*	CDAI ≤2.8
C-reactive protein ≤1 mg/dL	
Patient global assessment ≤1 (on a 0~10 scale)	

ACR: American College of Rheumatology, EULAR: European League Against Rheumatism, SDAI: Simplified Disease Activity Index, CDAI: Clinical Disease Activity Index. *For tender and swollen joint counts, use of a 28 joint count may miss actively involved joints, especially in the feet and ankles, and it is preferable to include feet and ankles when evaluating remission.

The target endpoint should be established as soon as possible, as the likelihood of achieving remission or LDA significantly decreases if disease activity does not improve by at least 50% within the first 3 months [6].

RA activity measures

The ACR has identified five preferred measures of RA disease activity for routine clinical use to support a treat-to-target approach in RA management: Disease Activity Score in 28 Joints with erythrocyte sedimentation rate or C-reactive protein level (DAS28-ESR/CRP), Simplified Disease Activity Index (SDAI), Clinical Disease Activity Index (CDAI), Patient Activity Scale-II (PAS-II), and Routine Assessment of Patient Index Data 3 (RAPID3) (Table 2) [5]. These recommendations can guide physicians in adopting a treat-to-target strategy for RA treatment. The choice among these measures can be based on the physician's preference.

1) DAS28: The DAS28 assesses disease activity using a 28 joint count and provides a continuous score. Unlike the original DAS, it excludes joint grading and limits the joint count to 28. The score can be calculated using either ESR or CRP levels. Initially, these two types were assumed interchangeable. However, the cutoff thresholds for different disease activity stages were lower for DAS28-CRP than for DAS28-ESR [7]. DAS28, SDAI, and CDAI cut-off values were defined in Korean RA patients [8].

2) SDAI: The SDAI has been validated in both clinical practice and research settings. It has demonstrated superior sen-

Table 2. Characteristics of disease activity measures of rheumatoid arthritis

Measure	Formula	Remission	Disease activity			Time
			Low	Moderate	High	
DAS28	0.56×Sqrt (28TJC)+0.28×Sqrt (28SJC)+0.70×ln(ESR)+0.014×PtGA OR 0.56×Sqrt (28TJC)+0.28×Sqrt (28SJC)+0.36×ln(CRP+1)+0.014×PtGA+0.96	<2.6	2.6 to <3.2	3.2 to ≤5.1	>5.1	5 min+Lab
SDAI	28SJC+28TJC+PtGA+PrGA+CRP	≤3.3	>3.3 to ≤11.0	>11.0 to ≤26	>26	2 to 5 min+Lab
CDAI	28SJC+28TJC+PtGA+PrGA	≤2.8	>2.8 to 10	>10 to 22	>22	2 to 5 min
PAS-II	(HAQ-IIx3.33+Pain VAS+PtGA VAS)/3	≤0.25	>0.26 to 3.70	3.71 to <8.0	≥8.0	2 min
RAPID3	MDHAQ+Pain VAS+PtGA VAS	≤3	4 to 6	7 to 12	≥13	30 s to 2 min

TJC: tender joint count, SJC: swollen joint count, Sqrt: square root, ln: natural logarithm, Pt: patient, VAS: visual analogue scale, Pr: provider, GA: global assessment, ESR: erythrocyte sedimentation rate, CRP: C-reactive protein level, HAQ-II: Health Assessment Questionnaire-II, MDHAQ: Multidimensional HAQ, Lab: laboratory, DAS28: Disease Activity Score in 28 Joints, SDAI: Simplified Disease Activity Index, CDAI: Clinical Disease Activity Index, PAS-II: Patient Activity Scale-II, RAPID3: Routine Assessment of Patient Index Data 3.

sitivity and specificity compared to other composite scores in predicting when physicians decide to adjust DMARD therapy [9]. In addition, it demonstrates a strong correlation with sonographic outcomes [10].

3) CDAI: As a simplified version of the SDAI, the CDAI does not necessitate measuring an acute-phase reactant but utilizes the same assessments. It correlates strongly with other disease activity scores, response criteria, joint damage progression, and functional impairment [11]. CDAI allows for prompt treatment decisions based solely on clinical criteria, including joint evaluation, which are crucial target areas in RA. This feature is advantageous in both clinical trials and practice, as it avoids potential issues related to variability in acute-phase reactant measurements across different laboratories.

4) PAS-II: The PAS-II is a composite index comprising a 0 to 10 visual analog pain scale, a Physician Global Assessment also ranging from 0 to 10, and the Health Assessment Questionnaire-II (HAQ-II) [12]. It includes fewer questions compared to the original PAS and has been utilized to assess RA disease activity among Korean patients [13].

5) RAPID3: RAPID3 extends from the RAPID and relies solely on patient-reported outcomes, making it simple for patients to complete in clinic or at home. Unlike formal joint counts, RAPID3 does not require assessment of swollen joints but provides quantitative disease activity information comparable to DAS28, CDAI, or SDAI [14]. RAPID3 has proven to be a valuable disease activity index with results equivalent to those of DAS28, CDAI, and SDAI in Korean RA patients [15].

Remission criteria

The ACR and the EULAR collaborated to establish definitions of remission for use in clinical studies and practice. The ACR/EULAR remission criteria include definitions based on Boolean criteria or indices like the SDAI or CDAI (Table 1) [2,3]. These definitions have been extensively validated and are recognized for their ability to predict excellent radiographic outcomes better than other metrics such as DAS28 [16]. Both the US Food and Drug Administration and the European Medicines Agency have approved these remission criteria for use by pharmaceutical companies in clinical research and drug development. The SDAI and CDAI remission criteria, included in the index-based ACR/EULAR provisional definitions of remission as well as Boolean-based criteria, are not only more stringent but also more reliable than the DAS28 remission criteria, particularly because they demonstrate consistent results across different types of therapies.

QUALITY OF LIFE

QoL is a comprehensive term encompassing individuals' perspectives, satisfaction, and evaluations across various aspects of life, including physical health, functioning, psychological well-being, social roles, and relationships [17]. Health-related quality of life (HRQoL) specifically focuses on aspects related to illness, such as physical, social, functional, and psychological health. Measures of HRQoL provide subjective assessments across dimensions including pain, physical functioning, anxiety, depression, cognitive aspects like attention and memory, and social dimensions such as self-esteem and interpersonal relationships [18]. HRQoL is negatively impacted by high cumulative disease activity, functional limitations, as well as feelings of sadness and anxiety. Assessing functional status or QoL involves objective evaluation, often supplemented by patient-reported functional assessment tools alongside medical history and clinical findings.

Physical function evaluation

Physical function evaluation given the significant impact of active RA on physical function, tools designed to assess physical function serve as important markers of disease activity. Among the measures recommended for routine clinical use, the ACR identifies three as particularly suitable: the HAQ-II, the Multidimensional HAQ (MD-HAQ), and the Patient-Reported Outcomes Measurement Information System Physical Function 10-item Short Form (PROMIS PF-10a) [5].

1) HAQ-II: The HAQ was created because it is extensive (34 questions) and has some psychometric problems with score linearity and question clarity (https://www.forwarddatabank.org/calculator) [19]. The HAQ-II consists of 10 questions, each rated on a scale of four levels of difficulty. Half of these questions were directly adapted from the original HAQ and, like the HAQ, are scored from 0 to 3. The HAQ-II is less difficult to respond to and score than the HAQ. Korea HAQ, but not HAQ-II is available and validated in Korean [20].

2) MD-HAQ: The modified HAQ (M-HAQ) was created to address the original HAQ's extensive questionnaire, which could be time-consuming to complete. The M-HAQ reduces the number of questions to one or two per category, and calculates an overall score based on the average of these eight categories. Subsequently, the MD-HAQ was developed as an extension of the M-HAQ, expanding the questionnaire to 14 items in total (https://www.rheumguide.ca/rapid3.html) [21]. MD-HAQ was used as part of RAPID3 disease activity. MD-HAQ is available and validated in Korean [22].

3) PROMIS PF-10a: The PROMIS PF-10a is a concise patient questionnaire designed for assessing functional capacity, serving as an additional patient-reported tool (http://www.healthmeasures.net) [23]. It includes 10 questions about physical function, with responses graded on a 5-point scale ranging from "not at all" to "cannot accomplish." The PROMIS PF-10a is available and validated in Korean [24].

4) EQ-5D: The EuroQoL-5 dimension (EQ-5D) is a standardized tool utilized for measuring HRQoL (https://euroqol.org) [1]. Developed by the EuroQoL Group, it is extensively employed in clinical and economic evaluations of health and healthcare. The EQ-5D's descriptive system includes five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression, making it particularly pertinent for assessing RA patients. The EQ-5D is available and validated in Korean [25].

CONCLUSION

The current goal of RA treatment is to achieve either disease remission or a state of LDA to improve patients' QoL. The ACR supports five RA disease activity measures: DAS28-ESR/CRP, SDAI, CDAI, PAS-II, and RAPID3. These measures are endorsed for their accurate representation of disease activity, responsiveness to changes in disease status, ability to discriminate between different levels of disease activity (low, moderate, high), and inclusion of remission criteria. By incorporating these validated RA disease activity tools, Korean physicians can effectively implement treat-to-target strategies in RA therapy, thereby, enhancing adherence to treatment recommendations in clinical practice. Moreover, the regular use of these measurements will enable physicians to deliver high-quality RA treatment that aligns with acceptable quality indicators.

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CONFLICT OF INTEREST

Y.H.L. has been an editorial board member since March 2010 but has no role in the decision to publish this article. J.B.J. was the director of publications in May 2014 to May 2018, and will be an associate editor and chairman since 2023. Two but has no role in the decision to publish this article.

AUTHOR CONTRIBUTIONS

Y.H.L. and J.B.J. conceived and designed the study. Y.H.L. and J.B.J. were responsible for data acquisition, analysis, and interpretation. Y.H.L. drafted the manuscript. Y.H.L. and J.B.J. reviewed and revised the manuscript. All the authors approved the final version of the manuscript.

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REFERENCES

1. Kim H, Sung YK. Epidemiology of rheumatoid arthritis in Korea. J Rheum Dis 2021;28:60-7.
2. Fraenkel L, Bathon JM, England BR, St Clair EW, Arayssi T, Carandang K, et al. 2021 American College of Rheumatology guideline for the treatment of rheumatoid arthritis. Arthritis Rheumatol 2021;73:1108-23.
3. Smolen JS, Landewé RBM, Bijlsma JWJ, Burmester GR, Dougados M, Kerschbaumer A, et al. EULAR recommendations for the management of rheumatoid arthritis with synthetic and biological disease-modifying antirheumatic drugs: 2019 update. Ann Rheum Dis 2020;79:685-99.
4. Singh JA, Saag KG, Bridges SL Jr, Akl EA, Bannuru RR, Sullivan

MC, et al. 2015 American College of Rheumatology guideline for the treatment of rheumatoid arthritis. Arthritis Care Res (Hoboken) 2016;68:1-25.
5. England BR, Tiong BK, Bergman MJ, Curtis JR, Kazi S, Mikuls TR, et al. 2019 update of the American College of Rheumatology recommended rheumatoid arthritis disease activity measures. Arthritis Care Res (Hoboken) 2019;71:1540-55.
6. Norvang V, Sexton J, Kristianslund EK, Olsen IC, Uhlig T, Bakland G, et al. Predicting achievement of the treatment targets at 6 months from 3-month response levels in rheumatoid arthritis: data from real-life follow-up in the NOR-DMARD study. RMD Open 2018;4:e000773.
7. Song GG, Lee YH. Comparison of disease activity score 28 using c-reactive protein and disease activity score 28 using erythrocyte sedimentation rate in assessing activity and treatment response in rheumatoid arthritis: a meta-analysis. J Rheum Dis 2016;23:241-9.
8. Park SY, Lee H, Cho SK, Choi CB, Sung YK, Bae SC. Evaluation of disease activity indices in Korean patients with rheumatoid arthritis. Rheumatol Int 2012;32:545-9.
9. Smolen JS, Aletaha D, Gruben D, Zwillich SH, Krishnaswami S, Mebus C. Brief report: remission rates with tofacitinib treatment in rheumatoid arthritis: a comparison of various remission criteria. Arthritis Rheumatol 2017;69:728-34.
10. Wong AL, Harker JO, Park GS, Paulus HE. Longitudinal measurement of RA disease activity in a clinical practice setting: usefulness of the SDAL [abstract]. Arthritis Rheum 2004;50:S386-7.
11. Fleischmann R, Strand V, Wilkinson B, Kwok K, Bananis E. Relationship between clinical and patient-reported outcomes in a phase 3 trial of tofacitinib or MTX in MTX-naïve patients with rheumatoid arthritis. RMD Open 2016;2:e000232.
12. Wolfe F, Michaud K, Pincus T. A composite disease activity scale for clinical practice, observational studies, and clinical trials: the patient activity scale (PAS/PAS-II). J Rheumatol 2005;32:2410-5.
13. Seo MR, Kim G, Moon KW, Sung YK, Yoo JJ, Yoon CH, et al. Quality indicators for evaluating the health care of patients with rheumatoid arthritis: a Korean expert consensus. J Korean Med Sci 2021;36:e109.
14. Pincus T, Swearingen CJ, Bergman MJ, Colglazier CL, Kaell AT, Kunath AM, et al. RAPID3 (routine assessment of patient index data) on an MDHAQ (multidimensional health assessment questionnaire): agreement with DAS28 (disease activity score) and CDAI (clinical disease activity index) activity categories, scored in five versus more than ninety seconds. Arthritis Care Res (Hoboken) 2010;62:181-9.
15. Kim SK, Park SH, Bae J, Son JT, Choe JY. Performance of routine assessment of patient index data 3 (RAPID3) for assessment of rheumatoid arthritis in clinical practice: differential agreement of RAPID3 according to disease activity categories. Rheumatol Int 2014;34:1311-8.
16. Bykerk VP, Massarotti EM. The new ACR/EULAR remission criteria: rationale for developing new criteria for remission. Rheumatology (Oxford) 2012;51 Suppl 6:vi16-20.
17. Megari K. quality of life in chronic disease patients. Health Psychol Res 2013;1:e27.
18. Patrick DL, Erickson P. Assessing health-related quality of life for clinical decision-making. In: Walker SR, Rosser RM, eds. Quality of life assessment: key Issues in the 1990s. Dordrecht, Springer, 1993, p. 11-63.
19. Wolfe F, Michaud K, Pincus T. Development and validation of the health assessment questionnaire II: a revised version of the health assessment questionnaire. Arthritis Rheum 2004;50:3296-305.
20. Bae SC, Cook EF, Kim SY. Psychometric evaluation of a Korean Health Assessment Questionnaire for clinical research. J Rheumatol 1998;25:1975-9.
21. Pincus T, Sokka T, Kautiainen H. Further development of a physical function scale on a MDHAQ [corrected] for standard care of patients with rheumatic diseases. J Rheumatol 2005;32:1432-9.
22. Lee SS, Park MJ, Yoon HJ, Park YW, Park IH, Park KS. Evaluating the Korean version of the multidimensional health assessment questionnaire in patients with rheumatoid arthritis. Clin Rheumatol 2006;25:353-7.
23. Wahl E, Gross A, Chernitskiy V, Trupin L, Gensler L, Chaganti K, et al. Validity and responsiveness of a 10-item patient-reported measure of physical function in a rheumatoid arthritis clinic population. Arthritis Care Res (Hoboken) 2017;69:338-46.
24. Kang D, Kim Y, Lim J, Yoon J, Kim S, Kang E, et al. Validation of the Korean version of the patient-reported outcomes measurement information system 29 profile V2.1 among cancer survivors. Cancer Res Treat 2022;54:10-9.
25. Kim MH, Cho YS, Uhm WS, Kim S, Bae SC. Cross-cultural adaptation and validation of the Korean version of the EQ-5D in patients with rheumatic diseases. Qual Life Res 2005;14:1401-6.