Comparison of the 1987 ACR criteria and the 2010 ACR/EULAR criteria in an inception cohort of patients with recent-onset inflammatory polyarthritis

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ABSTRACT

Objectives. *To compare the performance of the 1987 American College of Rheumatology (ACR) and the 2010 ACR/European League Against Rheumatism criteria for the classification of rheumatoid arthritis (RA).*

Methods. *Two-hundred and one patients aged 16 years or older with a 4-week to 12-month history of swelling of at least two joints and not previously treated with corticosteroids or disease-modifying anti-rheumatic drugs (DMARDs) were studied. The fulfillment of the 1987 and 2010 criteria was determined at baseline and at the end of the 1-year follow-up period. The sensitivity, specificity, positive and negative predictive values, positive and negative likelihood ratios, and accuracy of both sets of criteria were determined against three outcome measures: initiation of therapy with either methotrexate or any DMARD within the first year of follow-up, and clinical diagnosis according to physician's opinion after one year.*

Results. *At presentation, 145 patients fulfilled the 2010 criteria, and 108 the 1987 criteria for RA. The sensitivity, specificity and accuracy of the 2010 criteria were 0.80, 0.62 and 0.77 (0.58, 0.64 and 0.59 for the 1987 criteria) against the initiation of methotrexate therapy, 0.75, 0.73 and 0.75 (0.56, 0.91; 0.58 for the 1987 criteria) against the initiation of any DMARD therapy, and 0.87, 0.73 and 0.84 (0.69, 0.94; 0.75 for the 1987 criteria) against clinical diagnosis.*

Conclusion. *Compared with the 1987 criteria, the 2010 criteria are more sensitive and accurate, but less specific against two of the three outcome measures used, and classify more patients with RA at earlier stages of the disease.*

Introduction

For more than two decades, the 1987 American College of Rheumatology (ACR) criteria (1) have been widely used for the classification of rheumatoid arthritis (RA). However, over the last decade the therapeutic paradigm has progressively shifted to earlier treatment and it has been argued that the 1987 criteria do not perform well in early disease (2-5). Therefore, a joint working group from the ACR and the European League against Rheumatism (EULAR) has developed new classification criteria for RA (the 2010 ACR/EULAR criteria), which were derived from nine cohorts of patients with early arthritis by identifying factors that best discriminated between those who were at high risk of developing persistent and/or erosive disease and those who were not (6-8).

As stated by the ACR/EULAR working group, "it might be useful […] to document the proportions of study subjects who fulfill the previous 1987 and the new RA classification criteria, to enable comparisons" (6). Therefore, the aims of this study were to determine in an independent cohort of patients with recent-onset inflammatory polyarthritis (IP): 1) the proportions of patients who fulfill the 1987 criteria and the 2010 criteria at baseline and at the end of the 1-year follow-up period; 2) whether the 2010 criteria do identify RA patients earlier than the 1987 criteria; and 3) the performance of both sets of criteria for the classification of RA.

Materials and methods

Patients

This study is based in a recent-onset IP register established in Seville, Spain, in January 2002 (9, 10). Details of the assessment and follow-up procedures were previously described (9). Briefly, to be included in the register, patients had to be at least 16 years old, and have at least two swollen joints lasting for a minimum of 4 weeks and a maximum of 12 months. From January 2002 to December 2006, 469 patients fulfilled the criteria for inclusion in the register, but 33 (7.0%) were lost to follow-up. This left a total of 436 registered patients. After excluding 1) patients with crystal-induced, infectious, traumatic or paraneoplastic arthritis, osteoarthritis, spondyloarthritis, systemic lupus erythematosus, or systemic sclerosis, 2) patients previously treated with disease-modifying anti-rheumatic drugs (DMARDs) and/or corticosteroids, and 3) patients who did not give their informed consent, there remained 201 (46.1%) patients who had completed

the first year of follow-up by the time of this analysis. This is the study population, which consisted mainly of patients with RA or undifferentiated arthritis at presentation.

The 1987 criteria and the 2010 criteria for the classification of RA were used at baseline and in all follow-up assessments, and cumulatively applied. According to the 1987 criteria (list format), patients were classified as having RA if they fulfilled at least four of the seven criteria (1. morning stiffness, 2. arthritis of ≥3 joint areas, 3. arthritis of hand joints, 4. symmetric arthritis, 5. rheumatoid nodules, 6. serum rheumatoid factor, and 7. radiographic changes); criteria 1 to 4 might have been present for at least 6 weeks (1).

Three prerequisites must be fulfilled for the application of the 2010 criteria (6). The first is the absence of erosions typical of RA, which are considered *prima facie* evidence of RA and lead to immediate classification as such. According to the inclusion criteria for this study, all our 201 patients fulfilled the other two prerequisites: the presence of obvious clinical synovitis in at least one joint (we required at least two affected joints for inclusion in our recent-onset IP register), and the absence of an alternative diagnosis better explaining the synovitis (see exclusion criteria above). Patients without erosions were classified as RA when they had a score of 6 or greater (out of 10 possible) from the individual scores in four domains: number and type of involved joints (range 0–5), serologic abnormalities (score range 0–3), elevated acute-phase reactants (range 0–1), and symptom duration (range 0–1).

Both sets of criteria (1987 and 2010) were tested against three outcome measures: 1) the initiation of methotrexate (MTX) therapy within the 1-year follow-up period; 2) the initiation of treatment with any DMARD or combinations thereof within the same period; and 3) a diagnosis of RA established by an experienced rheumatologist within the same period.

Statistical methods

The proportions of patients classified as having RA according to the 2010 criteria and the 1987 criteria were calculated at baseline and by the end of the 1-year follow-up period. Two by two classification tables were used to calculate sensitivity, specificity, positive and negative predictive values, positive and negative likelihood ratios, and global accuracy for the proposed cut-off levels of both sets of criteria (≥6 for the 2010 criteria, and ≥4 for the 1987 criteria) against the three outcome measures. To see whether the 2010 criteria identify disease at earlier stages than the 1987 criteria, the proportion of patients fulfilling the 2010 criteria at baseline was calculated among those patients who did fulfill the 1987 criteria at the end of the follow-up period, but not at baseline.

Table I. Baseline characteristics of 201 patients with early-onset inflammatory polyarthritis.

Characteristics	All patients (n=201)	2010 criteria (n=145)	1987 criteria (n=108)
Age (years; mean [SD])	51.4 (17.2)	55.1 (16.3)	56.5 (16.6)
Women (n, %)	144 (71.6)	111 (76.5)	87 (80.1)
Disease duration (months; mean [SD])	6.3 (3.8)	5.9 (3.6)	6.1 (3.7)
<6 weeks (n, %)	10 (5.0)	7 (4.8)	0*
≥6 weeks (n, %)	191 (95.0)	138 (95.2)	108 (100)
SJC of 76 joints (mean [SD])	12.0 (6.9)	11.4 (6.1)	12.3 (5.9)
1 medium/large joint (n, %)	0¥	0¥	0¥
2–10 medium/large joints (n, %)	9 (4.5)	3 (2.1)	1 (0.9)
1–3 small joints (n, %)	32 (15.9)	13 (8.9)	3 (2.8)
4–10 small joints (n, %)	85 (42.3)	54 (37.3)	49 (45.4)
>10 joints (n, %)	75 (37.3)	75 (51.7)	55 (50.9)
DAS28 (mean [SD])	5.7 (1.3)	6.0 (1.2)	6.2 (1.1)
HAQ (mean [SD])	1.1 (0.7)	1.1 (0.6)	1.2 (0.6)
CRP (mg/L; mean [SD])	13.8 (15.7)	18.3 (19.3)	20.6 (19.7)
ESR (mm/h; mean [SD])	37.5 (22.0)	40.4 (24.4)	41.5 (24.3)
normal CRP and ESR (n, %)	52 (25.9)	30 (20.7)	18 (16.7)
abnormal CRP or ESR (n, %)	149 (74.1)	115 (79.3)	90 (83.3)
Anti-CCP concentration (IU/mL; mean [SD])	68.3 (97.8)	92.9 (105.6)	107 (111.2)
RF concentration (IU/mL; mean [SD])	137.0 (281.5)	184.7 (318.7)	208.3 (337.1)
Anti-CCP positive (n, %)	88 (43.8)	83 (57.2)	63 (58.3)
RF positive (n, %)	85 (42.3)	79 (54.5)	66 (61.1)
negative anti-CCP and RF (n, %)	101 (50.3)	46 (31,7)	32 (29.6)
low-positive anti-CCP or RF (n, %)	25 (12.4)	26 (17.9)	15 (13.9)
high-positive anti-CCP or RF (n, %)	75 (37.3)	73 (50.4)	61 (56.5)
Erosive disease (n, %)	54 (26.9)	54 (37.2)	51 (47.2)
RA according to 2010 criteria (n, %)	145 (72.1)	145 (100)	101 (93.5)
RA according to 1987 criteria (n, %)	108 (53.7)	101 (69.7)	108 (100)

*There are no patients in this group because the 1987 criteria require disease duration ≥ 6 weeks.
¥ There are no patients in this group because the inclusion criteria in our recent-onset IP register required at least two swollen joints.
SD: standard deviation; SJC: swollen joint count; DAS28: Disease Activity Score (28-joint count); HAQ: Health Assessment Questionnaire; CRP: C-reactive protein; ESR: erythrocyte sedimentation rate; Anti-CCP: anti-cyclic citrullinated peptide antibodies; IU: international units; RF: rheumatoid factor; RA: rheumatoid arthritis.

Results

The baseline characteristics of the study population are shown in Table I. The 201 patients, 71.6% of which were women, had a mean age of 51.4 years, a mean disease duration of 6.3 months and a mean Disease Activity Score (28 joints count) of 5.7. Fifty-four patients (26.9%) had erosions already at baseline.

At presentation, 145 (72.1%) patients fulfilled the 2010 criteria, and 108 (53.7%) the 1987 criteria. After 1 year, these figures increased to 154 (76.6%), and 142 (70.6%), respectively. MTX therapy was initiated during the first year of follow-up in 162 (80.6%) patients, and therapy with any DMARD or combinations thereof in 190 (94.5%) patients. By the end of the follow-up period, 152 (75.6%) patients were clinically diagnosed of RA by an experienced rheumatologist.

At baseline, among the 145 patients fulfilling the 2010 criteria, 44 (30.3%) did not fulfill the 1987 criteria. Conversely, among the 108 patients fulfilling the 1987 criteria, only 7 (6.5%) did not

Table II. Two by two tables comparing the 1987 and the 2010 criteria for the classification of RA with the three outcome measures.

		Outcome measures					
		MTX		DMARD		RA	
		Yes	No	Yes	No	Yes	No
2010 criteria	Yes	130	15	142	3	132	13
	No	32	24	48	8	20	36
1987 criteria	Yes	94	14	107	1	105	3
	No	68	25	83	10	47	46

MTX: methotrexate therapy initiated within 1 year; DMARD: therapy with any disease-modifying anti-rheumatic drug initiated within 1 year; RA: rheumatoid arthritis diagnosed within 1 year.

Table III. Performance of the 2010 and the 1987 criteria for the classification of RA.

	Outcome measures					
	MTX		DMARD		RA	
	2010	1987	2010	1987	2010	1987
Sensitivity	0.80	0.58	0.75	0.56	0.87	0.69
Specificity	0.62	0.64	0.73	0.91	0.73	0.94
PPV	0.90	0.87	0.98	0.99	0.91	0.97
NPV	0.43	0.27	0.14	0.11	0.64	0.49
LR+	2.09	1.62	2.74	6.19	3.27	11.28
LR–	0.32	0.65	0.35	0.48	0.18	0.33
Accuracy	0.77	0.59	0.75	0.58	0.84	0.75

MTX: methotrexate therapy initiated within 1 year; DMARD: therapy with any disease-modifying anti-rheumatic drug initiated within 1 year; RA: rheumatoid arthritis diagnosed within 1 year; PPV: positive predictive value; NPV: negative predictive value; LR: likelihood ratio.

fulfill the 2010 criteria; 101 (50.3%) fulfilled both sets of criteria. Thirty-two patients fulfilled the 1987 criteria over the first year, but not at baseline; of these, 26 (81.3%) did fulfill the 2010 criteria at baseline.

Tables II and III show the performance of both sets of criteria for the classification of RA. The 2010 criteria had greater sensitivity and accuracy than the 1987 criteria against all three outcome measures; conversely, the 1987 criteria had greater specificity, except against the initiation of MTX therapy, for which both criteria sets had similar specificity.

Discussion

We have compared the performance of the 1987 ARA and the 2010 ACR/EULAR criteria in a cohort of recent-onset IP patients that was not used for the derivation of the 2010 criteria. A high percentage of patients in this cohort (94.5%) were treated with any DMARD or combinations thereof (80.6% with MTX). This can be accounted for, at least in part, by their high mean baseline DAS28 (5.7) and the fact that 26.9% had erosions already at baseline.

The performance of both sets of criteria was tested against three outcome measures: 1) the one used to derive the 2010 criteria, *i.e.* initiation of MTX treatment within the 1-year follow-up; 2) a similar alternative outcome measure, *i.e.* initiation of treatment with any DMARD or combinations thereof within the same period; and 3) expert opinion, *i.e.* a diagnosis of RA established by an experienced rheumatologist within the same period.

Accuracy of both sets of criteria was similar against initiation of MTX or any DMARD, but higher against expert opinion (Table III). Using the initiation MTX therapy outcome measure, the 2010 criteria had a greater sensitivity and accuracy than the 1987 criteria, but the specificity was similar for both criteria sets. Using the other two outcome measures, the 2010 criteria were again more sensitive and accurate, but less specific than the 1987 criteria (Table III). Higher sensitivity and lower specificity of the 2010 criteria compared with the 1987 criteria have been observed in similar studies based in early arthritis cohorts (11-14).

The lower specificity of the 2010 criteria against two of the three outcome measures indicates that its use could lead to overclassification and a subsequent increase in the risk of unnecessary treatment. However, it should be noted that the absolute number of false positive RA cases obtained with the 2010 criteria against these outcome measures was very low in our cohort: 3 cases (1.5%) against DMARD therapy and 13 (6.5%) against expert opinion, *versus* 1 and 3, respectively, with the 1987 criteria (Table II).

The main objective of the 2010 criteria was to achieve earlier identification of RA. Our results indicate that this aim has been achieved, since 26 of the 32 patients (81.3%) who fulfilled the 1987 criteria over the first year, but not at baseline, did fulfill the 2010 criteria at baseline. This ability to achieve earlier identification of RA has also been reported in other cohorts (12, 14).

In conclusion, in this cohort, the 2010 criteria were more sensitive and accurate than the 1987 criteria, and allowed earlier identification of RA. Their lower specificity against two of the three outcome measures used raises the issue of a potential for overclassification and overtreatment. However, this lower specificity resulted in very low excess number of false positive RA cases compared with the 1987 criteria.

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