**Title:** The Multi-biomarker Disease Activity Score as a Predictor of Radiographic Progression in a Longitudinal Registry of Patients with Rheumatoid Arthritis

**Suggested authorship:** EH Sasso, G Wu, CC Hwang, BRASS authors, C Alexander, OG Segurado

**Background**. This study evaluates the association between the multi-biomarker disease activity (MBDA) blood test, CRP and clinical measures of disease activity at baseline with the rate of radiographic progression over 2 years for patients with rheumatoid arthritis (RA) receiving stable therapy in the US Brigham and Women’s Hospital Rheumatoid Arthritis Sequential Study (BRASS) Registry.

**Methods.** MBDA scores, CRP, DAS28-CRP, CDAI, RAPID3, and radiographic progression were analyzed at baseline (defined as the initial visit in the BRASS registry), for 143 patients with RA who had received a stable treatment, not adding or removing DMARDs and irrespective of dosing, over 2 years. Radiographs of hands and wrists only, taken within 3 months of baseline in BRASS and 2 years later, were evaluated to determine the change per year in total Sharp score (∆TSS). Radiographic progression (RP) was defined as ∆TSS >3 per year over 2 years. Predictive performance was assessed using AUROC. Associations with RP were evaluated using univariate and multivariate logistic regression adjusted for potential confounders.

**Results**. For 143 patients, mean age and disease duration were 59 and 18 years, respectively, with 84% female, 80% seropositive (RF+ and/or anti-CCP+), and 52% receiving MTX/non-biologic DMARD monotherapy, 19% a TNF inhibitor alone, 27% both in combination, and 2% not on any DMARD therapy. Mean baseline values were MBDA score=39, CRP=0.86 mg/dL, DAS28-CRP=4.1, CDAI=24.8, RAPID3=8.1 and TSS=68. RP was observed in 18% (26/143) of patients. Baseline MBDA score had the highest predictive accuracy of RP (AUROC=0.75) compared with baseline clinical CRP (AUROC=0.71), DAS28-CRP (AUROC=0.62), CDAI (AUROC=0.59) or RAPID3 (AUROC=0.50). Adjusting for BMI and baseline TSS, MBDA score (OR1SD=2.88, 95% CI=1.69-4.93) and CRP (OR1SD=2.28, 95% CI=1.43-3.63) were significant independent predictors of radiographic progression, while DAS28-CRP (OR1SD=1.68, 95% CI=1.00-2.82), CDAI (OR1SD=1.42, 95% CI=0.87-2.31 ) and RAPID3 (OR1SD=1.68, 95% CI=0.58-1.51) were not. For patients with low CRP (≤1 mg/dL) at baseline, risk of RP was 34.8% (8/23) with high MBDA score (>44) versus 8.1% (7/86) with low/moderate MBDA score (≤44) (p=0.003).

**Conclusion.** Baseline MBDA score was a better predictor of radiographic progression over 2 years than CRP (including patients with CRP ≤1 mg/dL), DAS28-CRP, CDAI or RAPID3 in patients with RA on stable therapy from the BRASS registry. These findings confirm previous studies in European and Japanese populations and indicate that the MBDA score reflects the processes driving joint damage in RA and may help patient management.