Repeated teaching courses of the modified Rodnan skin score in systemic sclerosis

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ABSTRACT

Objective. *To evaluate the efficacy of a repeated teaching process of the modified Rodnan skin score (MRSS) in systemic sclerosis (SSc). The question is whether a repeated teaching course is required to maintain good results after a first, successful teaching process.*

Methods. *Two consecutive teaching courses were organised by two Romanian EUSTAR centres for the same rheumatologists, to evaluate and compare the inter-observer variability. Coefficients of variation, the intra-class correlation coefficients (ICC) and the within patient standard deviations were calculated.*

Results. *The ICC showed good agreement between 12 participants of both the first teaching course (0.639) and of the course seven months later (0.684).*

Conclusion. *For rheumatologists, a good ICC that is close to 0.7 can be achieved, and these results remain stable without the need for another, repeated teaching cycle. The high inter-rater variations seen in some patients demand that, in clinical studies, the same investigator should assess the same patient at each visit.*

Introduction

Systemic sclerosis (SSc) is characterised by vascular abnormalities, fibrosis, and inflammatory changes. More extensive skin involvement coincides with more severe internal organ manifestation(s), poor prognosis, and increased disability (1-6). There are some fully or partially validated mechanical devices to measure different properties of the skin, as the durometer, the ultrasound, the elastometer, the plicometer and the tonometer (7-9). However, the modified Rodnan skin score (MRSS), which uses clinical palpation to estimate skin thickness, is currently considered the most appropriate technique for measuring skin involvement in SSc. Several studies demonstrated that assessment of MRSS is easily applicable with a good face, convergent, divergent, and content validity, and is reliable, reproducible, accurate, and sensitive to change in the context of clinical trials (8, 10-13).

Assessment of MRSS requires some experience, and a careful teaching process (12). The intraclass correlation coefficient (ICC) may be low if MRSS is performed by inexperienced rheumatologists (14).

In the present study we demonstrated that it is possible to achieve stable, continuously good results with only one efficient teaching course.

Methods and investigators

Two consecutive teaching courses were organised by the Romanian EUSTAR centres. The grading of the modified Rodnan skin thickness score (11) is as follows: 0 = normal, 1 = thickened skin, 2 = thickened and unable to pinch, 3 = thickened and unable to move. The 17 evaluated areas are the face, anterior chest, anterior abdomen, and 7 bilateral sites including the upper arm, forearm, dorsum of the hand, fingers, thigh, lower leg, and dorsum of the foot.

The first course was held in Bucharest, with 26 participants, in December 2007 and the second course, with 20 participants, in Cluj 7 months later. Twelve rheumatologists from the first course also participated in the second course. Both courses were performed as previously described, with minor modifications (14). First the "master teacher" (LC) gave a talk to explain the technique, and then also demonstrated the patient assessment region by region, without revealing his score. The students were also asked to assess the particular region, and "vote" for the score. Then the teacher revealed his own score. The investigation of the particular region was immediately repeated with those students whose evaluations were substantially different from the

Table I. Results of the repeated MRSS teaching courses.

Study	n. of patients	n. of patients per investigator	n. of investigators	Mean	Within patient SD[1]	Coefficient of variation %	ICC[2] (95% CI[3])
				Inter-observer variability			
MRSS results of all participants							
Bucharest, 2007 Dec	13	12	26	10.9	3.5	32.5	0.662 (0.469; 0.870)
Cluj, 2008 July	7	7	20	15.2	5.3	35.1	0.643 (0.408; 0.900)
Results of those investigators who participated in both courses*							
Bucharest, 2007 Dec	13	12	12	11.3	3.6	32.0	0.639 (0.427; 0.861)
Cluj, 2008 July	7	7	12	16.0	5.2	32.5	0.684 (0.440; 0.917)

*only those examiners who participated in both consecutive teaching courses.
[1]Within patient standard deviation; [2]Intraclass correlation coefficient; [3]Confidence interval.

teacher's assessment. A particular emphasis was placed on the digits, chest and distal part of thighs.

The examiners then performed 17-26 investigations on 13 patients with SSc in Bucharest, and 20 investigations on 7 patients in Cluj. In Bucharest, another 3 experts (SR, CV, ND) evaluated the patients independently.

Statistical calculations

SPSS 15.0 for Windows (SPSS Inc., Chicago, IL, USA) was used. Box plot diagrams, coefficients of variation, the intra-class correlation coefficients (ICC) and the within patient standard deviations (within patient SD) were calculated as previously described (11, 15). The ICC reflects the degree of agreement between two or more examiners. An ICC value of 0.4 to 0.6 is considered as only "moderate", 0.6 to 0.8 as "good", and greater than 0.8 as "excellent" agreement (13).

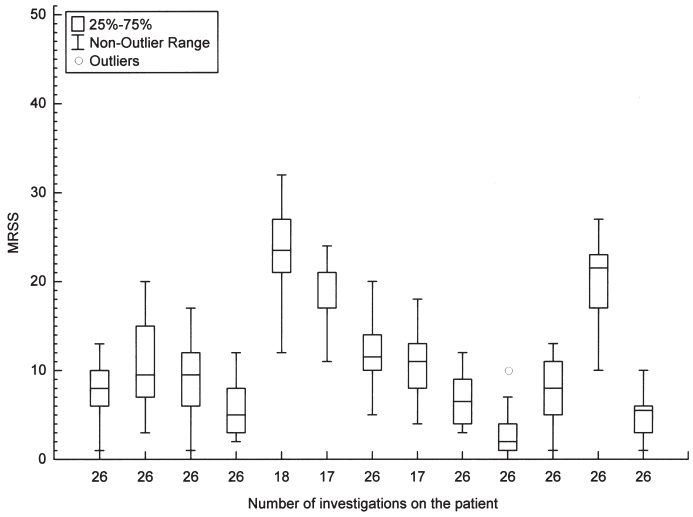

Fig. 1. Box plots of MRSS of the 26 young rheumatologists participating in the Bucharest course (17-26 examinations were performed on the 13 patients with SSc).

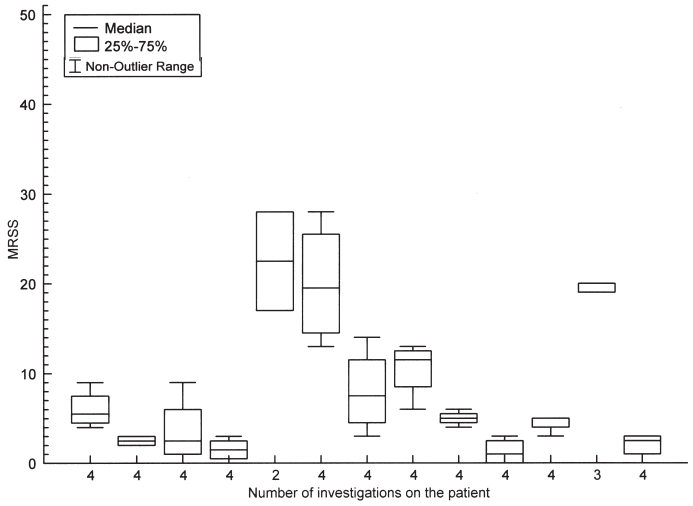

Fig. 2. Box plots of MRSS of the 4 experts participating in the Bucharest course (2-4 examinations were performed on the 13 patients with SSc).

Results

The ICC and within patient SD values of the two teaching courses are presented in Table I. Good agreement (ICC=0.662), and relatively low inter-observer variability (within patient SD=3.5) was found among the participants (Fig. 1). The ICC of the four teachers (LC, ND, SR, CV) was 0.743, with relatively low inter-observer variability (within patient SD=3.6) (Fig. 2).

20 rheumatologists participated in the second teaching course in Cluj 7 months later. 12 physicians from this group were also present at the first teaching course in Bucharest. The ICC of participants on this course (ICC=0.643) practically corresponded to the ICC seen previously in Bucharest (ICC=0.662), the interobserver variability was somewhat higher than previously seen (within patient SD=5.3) (Fig. 3).

The results of those 12 examiners (ICC=0.639) who participated in both courses practically corresponded with the ICC of the whole group (ICC=0.662) in the first course. These particular 12 participants constituted a relatively homogeneous cohort, as no extreme value and only one outlier MRSS score was found (Fig. 4A). The ICC of these 12 investigators only slightly improved during the second course, 7 month later (ICC=0.684) (Fig. 4B).

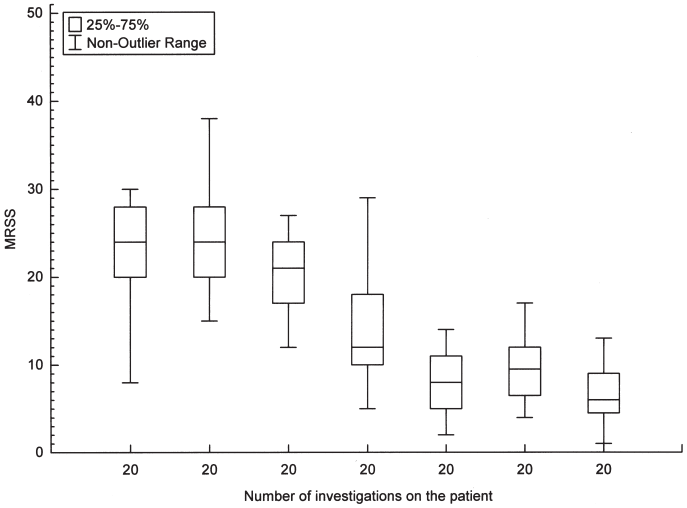

Fig. 3. Box plots of MRSS of the 20 examiners participating in the Cluj course (all 7 patients were examined by each investigator).

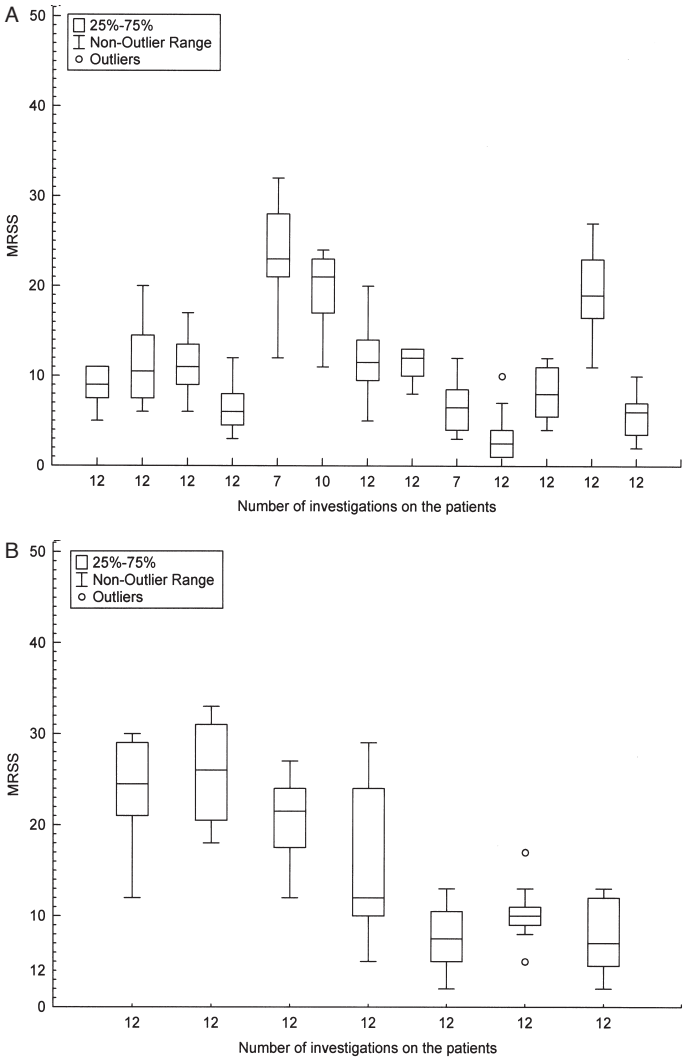

Fig. 4. Box plots of MRSS of the 12 examiners who participated in both the Bucharest and Cluj courses. (**A**) Bucharest course: the examiners performed 7-12 investigations on 13 scleroderma patients. (**B**) Cluj course: each of the 7 patients with SSc was examined by all of the 12 examiners.

Although no significant difference was seen between the ICC of the participants from Cluj and Bucharest, the division of the examiners in the Cluj course into "beginners" and those with repeated teaching course experience revealed that the ICC in the second group was higher (ICC=0.684) compared to the examiners with no previous MRSS evaluation experience (ICC=0.565) (Fig. 5).

Extreme values (defined as values outside the 3 box length range from the upper and lower value of the box) were observed in only one case (Fig. 5.), and outliers (defined as MRSS values higher than the upper value of the box in the box plot + outlier coefficient*/ upper value of the box – lower value of the box/) were also not frequently seen on box plot graphs (Figs. 1, 4, and 5).

The analysis of the SSc subsets showed similar coefficients of variation in dcSSc patients and the whole patient group at both MRSS teaching courses (25.9% and 30.6% *vs*. 32.5% and 35.1% in the whole patient groups). Interestingly, the coefficients of variation in lcSSc subgroups were higher in both teaching courses (42.1% and 45.9%) compared to the dcSSc subset.

As expected, the within patient SD was higher in dcSSc compared to the lcSSc subset in both courses (3.6 and 6.3 in dcSSc subset, *vs*. 3.4 and 3.8 in lcSSc subset).

Almost half of the examiners of these two courses were involved in daily clinical practice of general rheumatology, and there were no significant differences in the within patient SD values and coefficients of variation between this particular group compared to the other half of rheumatologists working in tertiary care centres (data not shown).

Discussion

To work towards developing an efficient methodology for teaching the modified Rodnan skin score, we previously published the results of our teaching courses. Our previous experience (Pécs, Hungary) indicated that both variability and ICC were substantially improved by a repeated course if the results of the first course were not satisfactory. The coefficient of variation decreased from 54% to 32%, while ICC increased from 0.496 to the "good" level of 0.722, which was in the range of the level the expert group had reached (14).

If the results of a course are good, the question is whether they can be maintained or whether a repeated course is required to stabilise the results of the successful MRSS assessment. In our present study, the result of the first Romanian course in Bucharest was al-

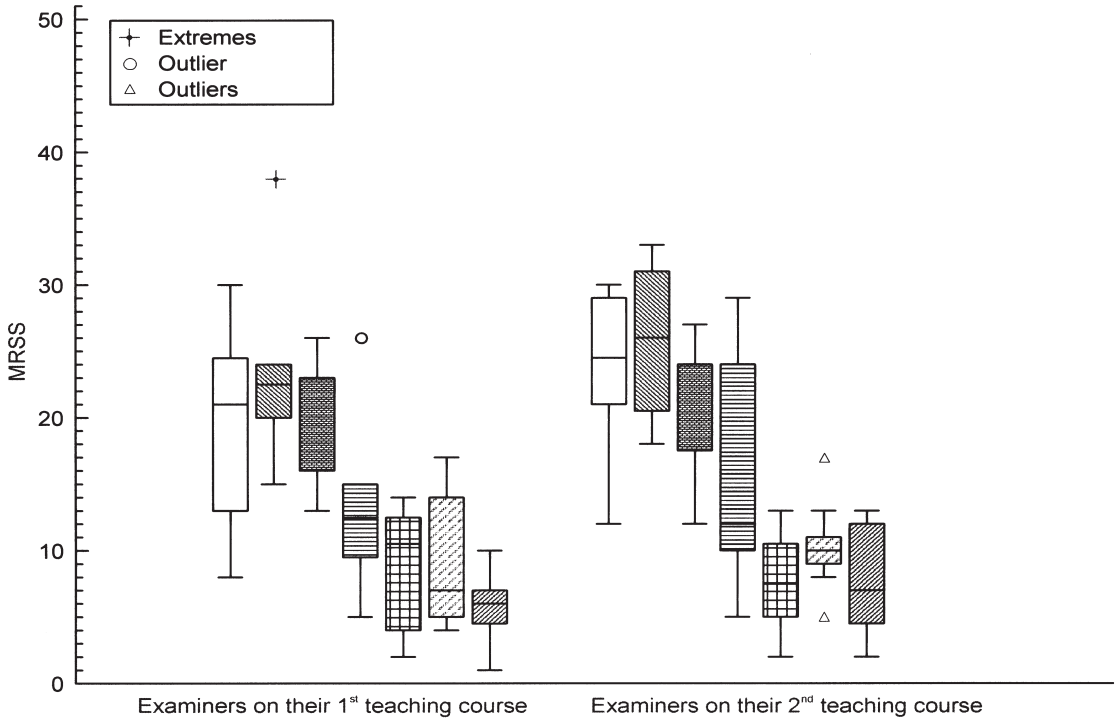

Fig. 5. Box plots of MRSS of the 20 examiners participating in the Cluj course: the first 7 box plots generated from the results of the 8 investigators who participated in a teaching course for the first time, the last 7 box plots show the results of the 12 examiners who had also participated in the previous Bucharest course.

ready good (ICC=0.662 for the whole group, and ICC=0.639 for the examiners who participated on both courses), and this good result remained reproducible in Cluj 7 months later (ICC=0.643 for the whole group, and ICC=0.684 for the examiners who participated on both courses), indicating that the efficacy of a successful course with good ICC can be maintained, and there is no need to repeat the teaching process. ICC values within the good agreement range were obtained both by the examiner groups with no previous experience and those who have already participated on a teaching course 7 month earlier. As the organization of a teaching course includes the participation of a teacher with validated MRSS count technique and the enrolment of a relative high number of scleroderma patients (both from lcSSc and dcSSc subset), we consider that there is no need for a repeated teaching course if the first one has lead to satisfactory ICC results. Nevertheless, if one's MRSS results are strikingly different from the group's and teacher's results (many extreme values on the box plot graph provided by the examiner), a second course should be considered for that particular person.

The within patient SD values reported from teaching courses organised in different countries vary predominantly between 3 and 5 (range: 2.5–8.5) (10). Clements *et al*. reported a within patient SD of 4.6. The results of the two teaching courses from Bucharest and Cluj fit well into this range (within patient SD of 3.5 and 5.3, respectively). Thus, we can conclude that the 3 to 5 points within patient SD achieved by scleroderma experts is sustainable even when the examiners do not have special experience in performing MRSS, but an ICC value better than approximately 0.7 may not be obtainable.

The higher coefficients of variation seen in lcSSc patients compared to the dcSSc subset highlight that one of the main tasks of the MRSS teaching course is to emphasise the difference between the skin thickening (sign of active process) and skin tethering (most commonly seen after long disease duration, when the skin is already thinned because of atrophy).

Extreme values and outliers were not frequent in our present study; however the high inter-rater variations seen in some of the investigated patients demand, that in clinical studies the same investigator should assess the skin score in the same patient on each visit (no substitutes are allowed, even if the original investigator is on vacation or out of town).

Our conclusion is that, for inexperienced rheumatologists, an ICC of about 0.7 and a within patient SD value of 3-5 can be achieved, and the results remain stable after several months. An intensive practical demonstration of the MRSS assessment lasting for at least 45 minutes is mandatory.

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