

A Validated Rating Scale for Hyperkinetic Facial Lines

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Objective: To test the reliability of a simple rating system to describe hyperkinetic facial lines.

Methods: A rated numeric kinetic line scale was developed and presented to 11 postresidency physicians specializing in aesthetic facial care. These physicians independently reviewed photographs of 20 patients, first at rest, then with activation of the frontalis, corrugator, and orbicularis oculi muscles. Kappa statistics for multiple raters were used to assess interobserver reliability.

Results: The nonweighted κ values were between 0.4 and 0.8 for the frontalis, corrugator, and orbicularis muscle groups. This represents moderate to substantial ob-

server agreement and is highly significant for each muscle group.

Conclusions: A new rating scale for hyperkinetic facial lines accounts for facial appearance at rest and with expression. It is easily used and has interobserver reliability. As the only objective and validated scale for hyperkinetic facial lines, this rated numeric kinetic line scale is recommended for the evaluation of pretreatment and posttreatment results in patients undergoing therapy for this problem. Moreover, an alternative scale rating resting and kinetic lines as independent variables is also being developed. Both must be considered to evaluate treatment outcomes when using neurotoxins.

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HYPERKINETIC FACIAL LINES are visible signs of facial aging. They arise largely from repetitive contraction of underlying facial muscles and can lead to changes in the elastic properties of the dermis.¹ Multiple modalities exist for the aesthetic treatment of this problem, including chemical peels, soft tissue fillers, surgical procedures, and muscle paralysis.²⁻⁵ Studies of hyperkinetic facial lines require a system for documenting appearance and change in appearance of the lines.

Multiple subjective evaluation systems appear in the literature. One of the first reported grading systems for facial lines used a 6-point scale to rate "crows' feet" in habitual smokers.⁶ Studies of botulinum toxin type A for hyperkinetic facial lines have also used subjective rating scales for evaluation. These studies, however, are difficult to compare because a single evaluation system has not been used or validated. In addition, these rating scales do not assess both resting state and dy-

namic activity. Assessment systems have included patient-rated as well as physician-rated schemata.⁷⁻¹³

Objective measures with quantitative assessment have also been used to evaluate hyperkinetic facial lines. These include computer-assisted and direct measurements of brow mobility and optical profilometry.¹⁴⁻¹⁶ The utility of these techniques in clinical practice is undermined by significant equipment requirements and specialized training. A MEDLINE review of the English-language articles published from 1966 to 2002 showed no validated rating scales for the assessment of hyperkinetic facial lines.

A need for a reliable rating system exists for several reasons. A common diagnostic tool would create a clear, definable language for discussion with colleagues and patients and enhance research by providing a single evaluation method to compare data between studies. Additionally, after significant data are compiled, a single evaluation tool for

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Rated Numeric Kinetic Line Scale Scores for Facial Wrinkles Secondary to Hyperkinetic Function

Score	Description
0	No wrinkles
1	Wrinkles not present at rest, fine lines with facial expression
2	Wrinkles not present at rest, deep lines with facial expression
3	Fine wrinkles present at rest, deeper with facial expression
4	Deep wrinkles at rest, deep furrows with facial expression

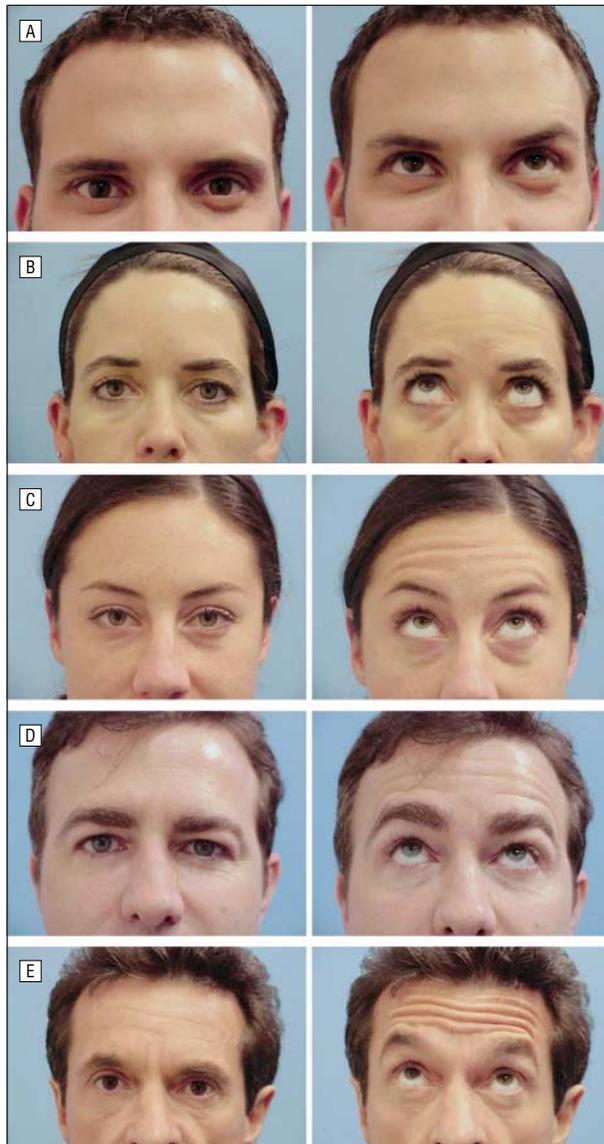


Figure 1. Assessment of frontalis hyperkinetic facial lines with the Rated Numeric Kinetic Line Scale (RNKLS): A, RNKLS 0; B, RNKLS 1; C, RNKLS 2; D, RNKLS 3; E, RNKLS 4.

hyperkinetic facial lines could provide a method for treatment stratification of patients.

The ideal rating system for hyperkinetic facial lines would be easy to use, noninvasive, allow for repeated

evaluations, and show interobserver reliability. In addition, this rating system would account for the dynamic nature of hyperkinetic facial lines as subjects are evaluated at rest and with effort of the facial musculature. We developed a rating system for hyperkinetic facial lines and tested its reliability.

METHODS

The Rated Numeric Kinetic Line Scale (RNKLS) was developed to rate hyperkinetic facial lines in the context of facial expression (**Table**). Dermal lines or lines of relaxed skin tension are excepted from the scale as they are not secondary to hyperkinetic function. A PowerPoint (Microsoft Corp, Redmond, Wash) slide presentation was created for each of the 3 muscle groups: frontalis, corrugator, and orbicularis oculi. Each presentation explained the rating system, showed photographic examples of each score (RNKLS 0-4), and presented a series of 20 subjects at rest and with expression (**Figures 1, 2, and 3**). Eleven postresidency physicians specializing in aesthetic facial care reviewed the presentations and independently assigned RNKLS scores to each series of 20 photographs.

Interobserver reliability was analyzed using a non-weighted κ statistic for each of the 3 muscle groups. Non-weighted κ statistics measure interobserver agreement and represent a standard method for evaluating reliability among multiple raters. More specifically, they test whether there is more agreement between observers than can be expected by chance.^{17,18}

RESULTS

Nonweighted κ statistics for the 11 observers' hyperkinetic facial lines caused by the frontalis, corrugator, and orbicularis oculi muscles are shown in the following tabulation:

Muscle Group	κ Score
Frontalis	0.64
Corrugator	0.52
Orbicularis oculi	0.43

As κ scores approach 1.0, the degree of interobserver agreement increases. Although arbitrary, κ statistics are labeled according to ranges originally described by Landis and Koch.¹⁸ They are poor (<0.00), slight (0.00-0.20), fair (0.21-0.40), moderate (0.41-0.60), substantial (0.61-0.80), and almost perfect (0.81-1.00). The frontalis ratings (0.64) showed substantial interobserver agreement. The corrugator (0.52) and orbicularis (0.43) both yielded moderate levels of agreement. All 3 series were highly statistically significant ($P < .001$).

COMMENT

The RNKLS has demonstrated moderate to substantial reliability among observers, with high statistical significance. In this series, the rating for the frontalis group showed relatively higher interobserver agreement than the ratings for the corrugator and the orbicularis oculi groups. This finding may indicate that this site is easier to categorize within the RNKLS.

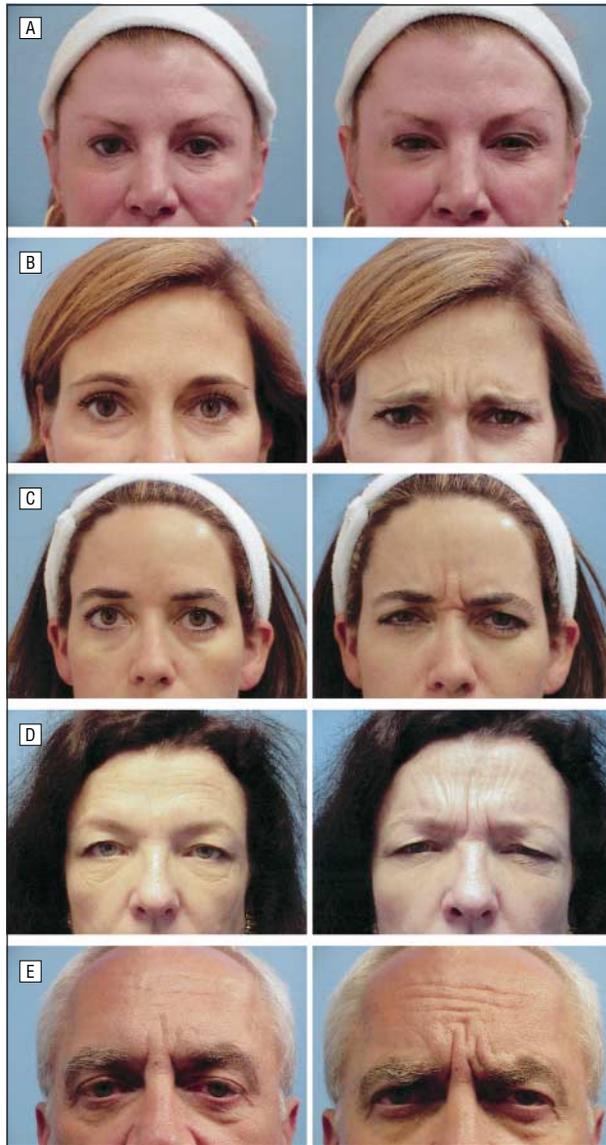


Figure 2. Assessment of corrugator hyperkinetic facial lines with the Rated Numeric Kinetic Line Scale (RNKLS): A, RNKLS 0; B, RNKLS 1; C, RNKLS 2; D, RNKLS 3; E, RNKLS 4.

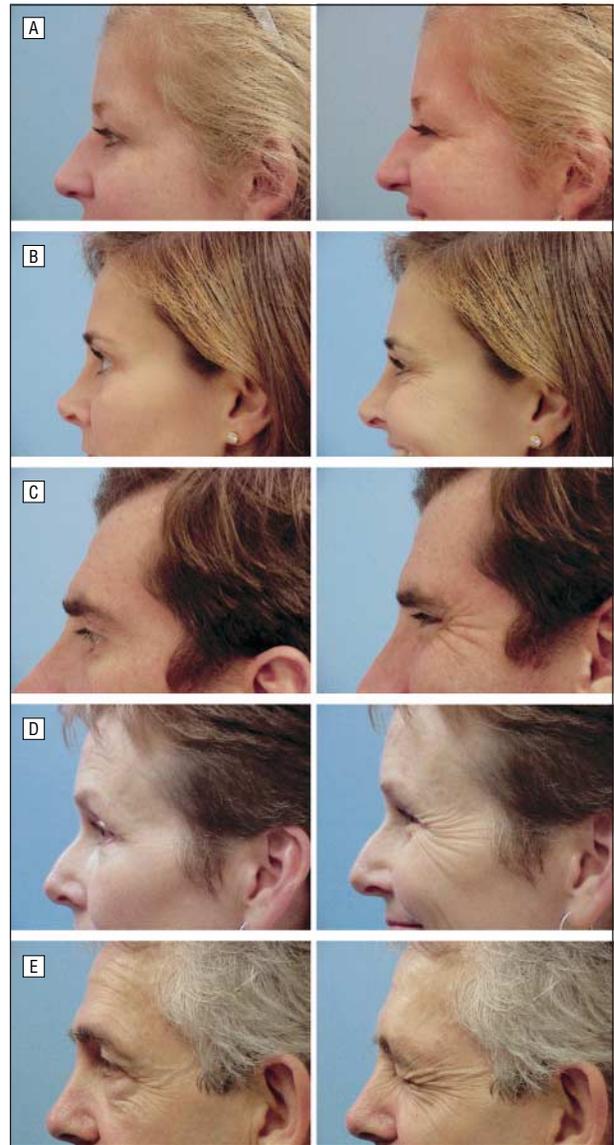


Figure 3. Assessment of orbicularis oculi hyperkinetic facial lines with the Rated Numeric Kinetic Line Scale (RNKLS): A, RNKLS 0; B, RNKLS 1; C, RNKLS 2; D, RNKLS 3; E, RNKLS 4.

It should be stressed that one of the advantages of the RNKLS is to allow evaluation of patients both at rest and with expression. Since hyperkinetic facial lines by definition are a function of muscle contraction, the ability of the RNKLS to take this into account makes it a more useful instrument. By easily learning how to use the scale with a simple set of instructions and examples, the observers demonstrated its ease of use. Objective measures such as computer-assisted measurements or optical profilometry are more tedious to achieve, more expensive, and more difficult to learn.

We believe that the RNKLS is a valuable tool for the assessment of hyperkinetic facial lines. It has potential as a highly useful rating system. We used the RNKLS successfully in the study of botulinum toxin type B (MyoBloc) and in our pilot study.¹⁹ The former showed the RNKLS to correlate with age in patients

treated with botulinum toxin type B. In short, the RNKLS is valuable to assess outcome measures, especially in prospective studies on hyperkinetic facial lines and their treatment. However, a scale used for outcome measures of treatments using neurotoxins should take into account resting and dynamic facial lines, and one is being developed.

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