Guy WM, et al., J Otolaryng Head Neck Surg 2016, 2: 004
DOI: 10.24966/OHNS-010X/100004

HSOA Journal of Otolaryngology, Head & Neck Surgery

Research Article

Establishing Objectivity in the McCollough Facial Rejuvenation System

Marshall Guy W[1], Jordan Rihani[2], Anthony E Brissett[3,4], Fred Fedok[2] and Gaylon McCollough E[2]*

[1]Department of Facial Plastic & Reconstructive Surgery, Dr. Guy Facial Plastic Surgery Clinic, Houston, Texas, USA

[2]Department of Facial Plastic & Reconstructive Surgery, McCollough Plastic Surgery Clinic, Gulf Shores, Alabama, USA

[3]Department of Facial Plastic and Reconstructive Surgery, Baylor College of Medicine Aesthetics Center, Houston, Texas, USA

[4]Bobby R. Alford Department of Otolaryngology-Head and Neck Surgery, Baylor College of Medicine, Houston, Texas, USA

Abstract

Importance

To bring focus on condition-specific treatment plans and improve comparability of various facial rejuvenation techniques and outcomes.

Objective

Provide objective criteria with which to validate the McCollough Facial Rejuvenation System.

Design

A prospective survey.

Setting

Private practice clinic.

Participants

Patients undergoing primary rhytidectomy between January 1, 2013 and December 31, 2013.

Main outcome measures

Intrarater and interrater reliability of the McCollough Facial Rejuvenation subscales, overall score, and stage of aging.

Results

The average intrarater Pearson correlation coefficient for the forehead is 0.77 (range 0.70-0.83), jowls is 0.77 (range 0.64-0.87), melolabial folds/marionette lines is 0.63 (range 0.44-0.80) and neck is 0.80 (range 0.54-0.90). The average intrarater Pearson correlation coefficient for the stages was 0.69 (range 0.63-0.80). The average interrater Pearson correlation coefficient for the stages at time 1 is 0.71 (range 0.60-0.84) and at time 2 is 0.62 (range 0.48-0.73).

Conclusions and relevance

The McCollough Facial Rejuvenation System, updated with objective criteria using previously validated subscales, has proven to have excellent INTRA and INTERrater reliability among a varied background of evaluators indicating its broad applicability.

Level of evidence

N/A.

***Corresponding author:** Gaylon McCollough E, Department of Facial Plastic & Reconstructive Surgery, McCollough Plastic Surgery Clinic, Cypress Bend Drive, Gulf Shores, Alabama, USA, Tel: +1 2519677600; Fax: +1 2519677689; E-mail: drmccollough@mccolloughinstitute.com

Citation: Guy WM, Rihani J, Brissett AE, Fedok F, McCollough EG (2016) Establishing Objectivity in the McCollough Facial Rejuvenation System. J Otolaryng Head Neck Surg 2: 004.

Received: November 16, 2015; **Accepted:** February 18, 2016; **Published:** March 07, 2016

Introduction

The McCollough Facial Rejuvenation System, originally published in 2011 by the senior author, was the first attempt to bring a condition-specific classification algorithm to facial rejuvenation [1]. The idea was to bring order to what was a myriad of surgical descriptions, often more of a marketing effort than descriptive of the actual procedures being performed. In this novel system the face was divided into four anatomic regions: forehead, temporal, cheek and neck. This was then used to assign an overall aging stage based loosely on the patient's chronological age but more importantly on subjective physical findings creating a biological age in order to determine an appropriate surgical plan (Table 1) [1].

Stage	Total Points	Biological Age	Treatment Plans
I	0-1	The less-than-30 face-lift	For the younger individual who has little or no loose skin and may require only liposuction to remove unwanted fat and bulges.
II	2-4	The 30-something face-lift	For the patient who is beginning to notice sagging of the brows and cheeks, but not the neck. Whenever sagging tissues are present, facial muscles and fat must be repositioned into their more youthful relationships. In such cases, a small amount of loose skin is removed.
III	5-8	The 40-something face-lift	For the patient who exhibits sagging brows, cheeks, and neck. Some of these patients may or may not need liposuction for contouring jowls and fullness under the chin. All, however, require suspension techniques to muscles and fat.
IV	9-12	The 50-something face-lift	For the patient with generalized facial and neck sagging, with or without jowls and wrinkles around the mouth. With more obvious muscle, fat, and skin laxity, more suspension of these structures is required.
V	13+	The 60-plus face-lift	For the patient with advanced aging, coupled with sagging of all facial areas including the forehead, brows, cheeks, and neck. At this stage in the aging process, deep folds develop in the groove between the nose and face, jowls droop below the jawline, and the muscle of the neck often produce string like bands that run vertically from the chin to the upper chest. Many of these patients are also beginning to exhibit wrinkles and blemishes over most of the face.

Table 1: The McCollough Condition-Specific Facial Rejuvenation Classification System.

Note: Table 1 represents the conversion of the total points for facial analysis into the corresponding McCollough Facial Rejuvenation Stage.

This algorithm was further expanded in 2012 to provide a more user-friendly classification guide better defining the "language of surgical rejuvenation." It provided appropriate descriptions of characteristics related to face-lifting, volume augmentation, and eyelid rejuvenation and added new descriptors to include the lips and earlobes to be more comprehensive. The purpose of the updated system was to further assist surgeons in developing a surgical plan for the separate regions based on the stage of aging, as opposed to a cookie cutter or one size fits all approach to facial rejuvenation [2]. Whereas objectivity is the goal of creating this facial rejuvenation staging system, this paper was still limited by the subjectivity of the classification system.

The goal of creating a facial classification system is not isolated to facial plastic surgery, but the goal of creating a condition-specific treatment plan to achieve total facial rejuvenation is. Other systems have been designed as scales to measure the aging face and the response to non-invasive cosmetic procedures such as filler injections and neuromodulators. Five-point photo numeric scales to assess brow position [3,4], forehead wrinkles [3,4], melolabial folds [3,5], marionette lines [3,5], jowls [5], and neck [6] have been developed and validated. Although not necessarily designed for preoperative surgical evaluation, these validated scales assess many of the same components as the McCollough Facial Rejuvenation System.

The purpose of this study is to introduce more objective, validated criteria to incorporate into the McCollough Facial Rejuvenation System to further improve its utility and applicability among aesthetic surgeons.

Methods and Materials

The research took place at a private clinic in Gulf Shores, Alabama. Inclusion criteria included adult patients who underwent a rhytidectomy between January 01, 2013 and December 31, 2013 at the McCollough Plastic Surgery Clinic. The patients must have been evaluated for a primary rhytidectomy as any previous rhytidectomy (neck, cheeks, temple, or forehead) was an exclusion criteria as this could affect the appearance of the areas to be evaluated. Once the patients had been identified based on a manual search of the operative schedule, the patients were arranged in numerical order by their chart number. A true, random number generator (www.random.org) was then used to select 20 charts. Each chart was then reviewed to verify that the patient had no previous history of a rhytidectomy and that appropriate preoperative photos were available (Mirror software by Canfield). Thirteen of the original 20 charts were excluded for the following reasons: two patients had preoperative photos that could not be located, one patient had a Mohs defect requiring reconstruction at the time of rhytidectomy, and 10 patients had a history of a rhytidectomy. The random number generator was again used in the similar fashion until a total of 20 patients who met inclusion criteria and did not meet exclusion criteria were determined. The patients were all female and ranged in age between 45 and 84 with an average age of 60.

For each patient, a total of 6 views were used for purposes of facial assessment (with the exception of one patient who lacked a left oblique view). These included frontal, bilateral obliques, bilateral profile, and a zoomed in view of the forehead/brow complex. A number was then placed on each photo sheet for purposes of record tracking but no personal information was included.

Although the McCollough Facial Rejuvenation System includes multiple subsites, sidedness, facial analysis, eye analysis, and skin texture, in order to begin the process of validation it was determined that focusing on one area at a time would provide the most utility and have the least variability. Therefore, the focus was on the facial analysis. The subunits of the face to be evaluated included the forehead, jowls, melolabial fold/marionette lines, and neck as they most correlated to the McCollough Facial Rejuvenation System forehead/temple (forehead), cheek (jowls and melolabial fold/marionette line), and neck.

Using the descriptions previously noted in the McCollough Facial Rejuvenation System and a series of photo numerical scales rated from 0-4 that had been previously validated [4-7], points were assigned to each stage (Table 1). For example, the patient who falls into a stage I would only have slight adiposity, usually seen in the jowl and submandibular regions. This would correlate to a forehead 0, melolabial fold/marionette line 0, jowls 1, and neck 0. Stage II patients have sagging of the brows and cheeks but not the neck. This correlates to a FH 0-1, melolabial folds/marionette lines 1, jowls 1-2, and neck 0 for a total of 2-4 points. Stage III patients are the 40 something patients. They exhibit sagging brows, cheeks, and necks. This would correlate to a FH 1-2, melolabial folds/marionette lines 1-2, jowls 1-2, and neck 1-2. The stage IV patient is the 50 something patient with generalized facial and neck sagging. This correlates to a FH 2-3, melolabial folds/marionette lines 3-4, jowls 1-3, and neck 3. The stage V patient is described having advanced aging, coupled with significant volume redistribution and sagging of all facial areas including the forehead, brows, cheeks, and neck. At this stage in the aging process, malar fat pads descend, hollowing occurs in the mid-cheek regions, deep folds develop in the groove between the nose and face (melolabial fold/marionette lines 4), jowls droop below the jawline (jowls 4), and the muscles of the neck often produce string like bands that run vertically from the chin to the upper chest (neck 3+). For the sagging of the forehead and brow this has the greatest variability in aging and was given the score of 2+ creating a total score of 13+ for stage V. A condition-specific treatment plan for each subsite was determined by the score assigned to that particular region. For example, an N-1 neck might only require liposuction, whereas an N-4 neck might require liposuction and platysmaplasty/myectomy with extensive SMAS suspension as seen in the patient in figure 1.

Figure 1: This patient was universally selected as a stage V. Her average score for forehead is 3.5 (range 3-4), fowls is 4 (range 4-4), melolabial fold/marionette lines is 4 (range 4-4), neck is 4 (range 4-4), and overall score is 15.5 (15-16).

	Points				
Region	0	1	2	3	4
Forehead	No wrinkles, very high brow with arch	Mild wrinkles, high brow with arch	Moderate wrinkles, medium brow position	Severe wrinkles, low and flat brow	Very Severe wrinkles, very low and flat brow
Melolabial fold/ Marionette Line	No visible folds, continuous skin line	Shallow but visible folds with slight indentation	Moderately deep folds, clear feature at normal appearance but not when stretched	Very long and deep folds; prominent facial feature	Extremely long and deep folds; detrimental facial appearance
Jowls	No jowling or superfluous adipose tissue	Mild jowling or superfluous adipose tissue. Lack of smooth jawline showing early signs of jowl formation	Moderate jowling or superfluous adipose tissue. Fullness in the lower cheek with visible marionette or melolabial fold	Severe jowling or superfluous adipose tissue. Greater fullness/ heaviness of the lower cheek. Prominent melolabial fold.	Very severe jowling or superfluous adipose tissue. Greater prominence of the melolabial folds. Jowls below the level of the chin
Neck	No sagging, no loose skin	Mild sagging or mild loose skin	Moderate sagging or moderate loose skin	Severe sagging or moderate loose skin	Very severe sagging or severe loose skin

Table 2: Numerical scoring description of each subsite.

Note: Table 2 represents objective descriptions of each subsite for evaluation.

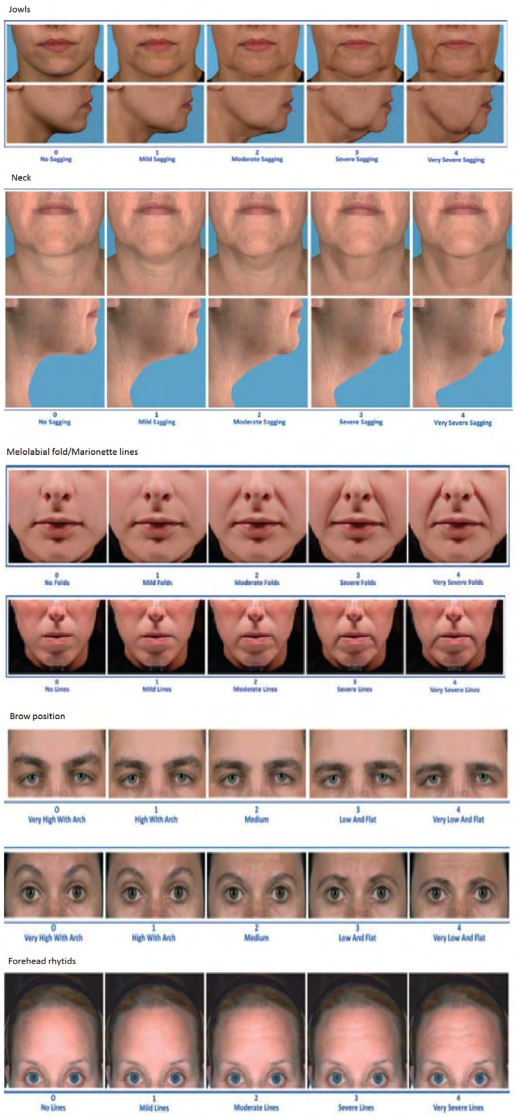

Figure 2: Visual scales for each facial sub site.

Note: Visual scales for facial analysis corresponding to the descriptions are provided in table 2.

The photonumeric scales coupled with written descriptions were then assembled as seen in table 2 and figure 2 which represents a computer generated morphing of the same patient with advancing degrees of aging. In cases where more than one criteria was assessed as in the forehead (brow position and wrinkles), points were assigned based on the more severely aged component (i.e., if they were wrinkle 2 and brow position 3 they were given a score of 3). The photo sheets for each patient were then evaluated by each of the four facial plastic surgeons (three board certified and fellowship trained and one currently in fellowship) and given a numerical score (0-4). An overall aging stage was calculated by adding the total numerical score based on table 1. This McCollough Facial Rejuvenation Stage was generated automatically by the addition of the points for each subsite.

The scores were recorded on a single sheet and provided to the primary author. After 30 days, the sheet with patient color photos was again sent to each evaluator for reevaluation of the faces. No attempt was made to randomize the order of the patients for the second facial analysis.

Using data points for the first and second evaluation time, a Pearson correlation coefficient was calculated for each rater between evaluation 1 and 2 (INTERrater reliability) for the individual subsites, the entire face, and for the overall stage using Microsoft Excel 2013. A Pearson correlation coefficient was also calculated for each total score and stage comparing each rater on a head to head basis (INTERrater reliability) for time 1 and 2. Values greater than 0.6 are considered to be high correlation [7].

Results

Twenty patients were chosen and met inclusion criteria as described above. The average age at the time of preoperative photography used for evaluation was 60.5 years (range: 45-84). The average INTRArater Pearson correlation between time 1 and 2 for all examiners for the forehead is 0.77, for the jowls is 0.77, for the melolabial fold and marionette line is 0.63, and for the neck is 0.80. The average INTRArater Pearson correlation for the total score for all examiners is 0.70. The breakdown for each examiner for each subscale is represented in table 3. The average INTRArater Pearson correlation for the overall stage of each patient is 0.69 and is shown in table 4.

	Rater				
Subsite	1	2	3	4	Average
FH	†0.81 (0.56-0.92)	†0.73 (0.42-0.89)	†0.70 (0.37-0.87)	†0.83 (0.61-0.93)	0.77
Jowls	†0.77 (0.50-0.90)	†0.64 (0.27-0.84)	†0.78 (0.51-0.91)	†0.87 (0.69-0.95)	0.77
ML/MAR	†0.77 (0.50-0.90)	†0.62 (0.24-0.83)	0.44 (0-0.74)	†0.80 (0.55-0.92)	0.63
Neck	†0.85 (0.65-0.94)	†0.89 (0.74-0.96)	*0.54 (0.13-0.79)	†0.90 (0.76-0.96)	0.8

Table 3: INTRArater Pearson correlation coefficient by subsite.

Note: Table 3 represents the Pearson correlation coefficient for each rater between times 1 and 2, the average among the four evaluators for each subsite, and the 95% confidence interval.
*p < 0.05
†p < 0.01

The average INTERrater Pearson correlation for time 1 is 0.71 and for time 2 is 0.62 with an average of times 1 and 2 being 0.66. The scores comparing each examiner to the other examiners at time 1 and then time 2 is represented in table 5.

Rater				
1	2	3	4	Average
†0.80 (0.55-0.92)	†0.63 (0.26-0.84)	†0.64 (0.27-0.84)	†0.68 (0.34-0.86)	0.69

Table 4: INTRArater Pearson correlation coefficient based on the stage.

Note: Table 4 represents the Pearson correlation based on the stage for each rater between time 1 and 2 and includes the 95% confidence interval.
*p < 0.05
†p < 0.01

	2-Jan	3-Jan	4-Jan	3-Feb	4-Feb	4-Mar	Average
Time 1	†0.62 (0.24-0.83)	†0.66 (0.31-0.85)	†0.69 (0.36-0.87)	†0.60 (0.21-0.82)	†0.84 (0.63-0.93)	†0.69 (0.36-0.87)	0.71
Time 2	†0.66 (0.31-0.85)	†0.73 (0.42-0.89)	†0.70 (0.37-0.87)	*0.48 (0.05-0.76)	*0.48 (0.05-0.76)	†0.68 (0.34-0.86)	0.62

Table 5: INTERrater Pearson correlation coefficient based on the stage.

Note: Table 5 represents the INTERrater Pearson correlation coefficient for time 1 and time 2 comparing each combination of evaluators.
*p < 0.05
†p < 0.01

Patients whose scores added up to create a unanimous stage 4 and 5 and a patient who received 7/8 stage 3 scores are included in figures 1, 3 and 4.

Figure 3: This patient was selected by 7/8 surveys as a stage III patient and 1/8 surveys selected as a stage II. Her average score for her forehead is 1.75 (range 1-3), jowls is 1.25 (range 1-2), melolabial fold-marionette lines is 1.125 (range 0-2), neck is 1.75 (range 1-2), and overall score is 5.875 (range 3-7).

Discussion

Creating a unifying algorithm to maximize patient surgical outcomes is the goal of a condition specific algorithm. Previous iterations have provided the foundation for this work but did not address validity and reliability, keys to making the facial staging system both applicable and universally acceptable. This work serves as the first step to creating a more scientific and less subjective approach towards that goal, based in the same concepts as the TNM staging system adopted for cancers. By creating objective conditions that define stages it will establish a language through which aesthetic surgeons can communicate ideas and experiences. Treatment plans will be tailored to the conditions present, thereby eliminating the one-size-fits-all commercialization of the profession. Results of the

Figure 4: This patient was universally selected as a stage IV. Her average score for her forehead is 2.8 (range 2-4), jowls is 2.625 (range 2-3), melolabial fold/marionette lines is 2.25 (range 2-3), neck is 3.25 (range 2-4), and overall score is 10.875 (range 9-13).

same techniques-performed by different surgeons-can be assessed, i.e., comparing stage II techniques and outcomes among surgeons as opposed to comparing results from a stage V to a stage I. Scientific programs can be more clearly focused, making better use of the time and resources of instructors and attendees, alike.

This work is the next step in creating a more extensive algorithm for facial rejuvenation. It only evaluated the forehead, cheek, and neck. The rationale was that these areas had validated scales based on objective criteria that had been developed through joint collaboration between various aesthetic specialists including dermatologists, oculoplastic surgeons, and plastic surgeons at interdisciplinary and international conferences. The collaboration used to create these scales indicates both an applicability and usability among various specialties [4-7].

Just as the scales were shown to have high correlation levels in the original research, so did this study. A Pearson correlation coefficient greater than 0.6 is considered to have high correlation [7]. To assess the reliability of both the subscales and the stage, patients were assessed by four facial plastic surgeons, at least 30 days apart. The highest average degree of correlation was found in the neck (0.8 range: 0.54-0.90), followed by the forehead (0.77 range: 0.70-0.83) and jowls (0.77 range: 0.64-0.87), and finally the melolabial fold and marionette lines (0.63 range: 0.44-0.80).

The neck likely had the highest correlation given its ease of evaluation with a profile view. The forehead also had a high degree of correlation, which was better than that seen in the original studies (Pearson correlation coefficients: 0.47-0.51). This compares to the dynamic forehead rhytids evaluation in the original studies showing scores of 0.67 at time 1 and 0.65 at time 2 [4]. In this evaluation the brow position and forehead rhytids were grouped together and not analyzed separately. Evaluators were instructed if there was a discrepancy in the score or asymmetry between the sides to use the more severe aging scale. For example, if the static rhytids were a 2 and the brow position a 3 then the forehead was rated as a 3. This likely improved the correlation among the evaluators by being able to use multiple factors to evaluate and settling on the most severe sign of aging. Nevertheless, the results in the original study and the current one show a high degree of INTRArater reliability. The purpose of this study was not to further validate the results of the previous studies but rather to help validate the McCollough Facial Rejuvenation System as a foundation upon which an algorithmic approach will be established. The stages that were created were based on the descriptions previously published for each stage matched to the point values given in each subscale as seen in table 1 [1]. As can be seen in table 4 there was also a high degree of INTRArater reliability for staging of the patients (average 0.69, range 0.64-0.80). Furthermore, as can be seen in table 5 there is also a high degree of INTERrater reliability for staging the patients with an average at time 1 of 0.71 (range: 0.60-0.84) and at time 2 of 0.62 (range 0.48-0.73).

It is the expectation that the McCollough Facial Rejuvenation System Condition-Specific Algorithm can be more applicable to the practicing aesthetic surgeon by proving its validity. The previously described condition specific algorithms were much more detailed than the one presented here [1,2]. The reasoning for this is to begin the validation process of the staging system by limiting its scope. Once each section of the staging process has been validated it can be further applied to create an overall condition specific treatment algorithm. Furthermore, the subsites chosen are those most frequently addressed at the time of what has traditionally been referred to as a surgical rhytidectomy, namely, the forehead, cheek, and neck. The temple area has been indirectly validated within the scope of forehead as brow position was included in this subscale.

Overall this study confirms the reliability of the staging system at least in its evaluation of the forehead, cheek, and neck. The evaluators included those in large academic institutions and those in private practice. The evaluators span the generations of facial plastic surgeons from one of the founding members of the specialty to one of its newest members. Even with diverse degrees of experience, the evaluators applied similar scores regarding the overall stage of facial aging using the objective criteria, both descriptive and photo documentation, provided within. The senior author interpreted this commonality as a step toward establishing a language by which facial plastic surgeons in the future will be better able to communicate ideas and ideals.

By providing this validation it is hoped that it can lay the foundation for a broader discussion on facial analysis and provide a means of comparing techniques and outcomes based on the severity of the aging process.

Conclusion

The McCollough Facial Rejuvenation System, updated with objective criteria using previously validated subscales, has proven to have excellent INTRA and INTERrater reliability among a varied background of evaluators indicating its broad applicability.

References

1. EG M (2011) The McCollough Facial Rejuvenation System: A Condition-Specific Classification Algorithm. Facial Plast Surg 27: 112-123.
2. McCollough EG, Ha CD (2012) The McCollough Facial Rejuvenation System: Expanding the Scope of a Condition-Specific Algorithm. Facial Plast Surg 28: 102-115.
3. Carruthers A, Carruthers J (2010) A validated facial grading scale: the future of facial ageing measurement tools? J Cosmet Laser Ther 12: 235-241.
4. Flynn TC, Carruthers A, Carruthers J, Geister TL, Görtelmeyer R, et al. (2012) Validated Assessment Scales for the Upper Face. Dermatol Surg 38: 309-319.
5. Narins RS, Carruthers J, Flynn TC, Geister TL, Görtelmeyer R, et al. (2012) Validated assessment scales for the lower face. Dermatol Surg 38: 333-342.

6. Sattler G, Carruthers A, Carruthers J, Flynn TC, Geister TL, et al. (2012) Validated assessment scale for neck volume. Dermatol Surg 38: 343-350.
7. Carruthers J, Flynn TC, Geister TL, Görtelmeyer R, Hardas B, et al. (2012) Validated assessment scales for the mid face. Dermatol Surg 38: 320-332.