Development and Validation of a Clinical Assessment Tool for Platysmal Banding in Cervicomental Aesthetics of the Female Neck

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Abstract

Background: In facial aesthetics, grading systems are useful tools for planning aesthetic procedures. One key component of rejuvenation—the anterior neck—has been relatively overlooked. In the 1980s, criteria were established for the appearance of a youthful neck. Considering the significant contribution of the anterior neck to the aesthetics of the lower face, updated and more extensive clinical evaluation tools are critical to successful execution and measurement of rejuvenation. A validated assessment scale has yet to be created for platysmal banding, one component of the anterior neck that significantly contributes to the aesthetics.

Objectives: The purpose of this study was to establish a validated platysmal banding scale for clinical application.

Methods: Three-dimensional standardized photographs from over 100 volunteer patients of various ages and ethnicities were analyzed to develop a five-point scale for platysmal banding. The scale was validated by a group of academic and nonacademic attending plastic surgeons as well as senior level plastic surgery residents then analyzed through a two stage process to ensure both interrater and intrarater validity.

Results: We measured the Intraclass Correlation Coefficients (ICC) for the interrater reliability. ICCs ranged from moderate to excellent agreement. Cronbach’s alpha, which represents intrarater reliability, was also calculated for the same sample with all results being good to excellent.

Conclusions: This study established a validated scale to assess the degree of platysmal banding in the female neck. This grading system has potential application in the preprocedure planning for patients considering face and neck rejuvenation to address platysmal banding.

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Grading systems often aid in the planning of aesthetic procedures and in the evaluation of outcomes. For evidence-based practice, grading systems provide the ability to assess new or adjusted techniques objectively. New innovations and developments in the field of facial rejuvenation have created an unmet need for assessment tools applicable to both clinical use and evidence-based evaluation.

One key area of facial rejuvenation—the anterior neck—has been frequently overlooked in the development of grading and classification. Many of the limited publications to date are from the 1980s, when the neck started to become an area of focus in the literature of plastic surgery. Dedo proposed a classification of the neck that focused specifically on cervical abnormalities. He suggested six classes encompassing various characteristics of the abnormal neck, including muscle accentuation as defined in Class IV. In addition, Ellenbogen and Karlin established five significant criteria for the appearance of a youthful neck. The delineation of these criteria established a guideline for outcome goals in the rejuvenation of the anterior neck; however, the work did not focus on measuring the aesthetic deformity in the region. Additional grading scales for anterior neck deformities exist, including one for cervico-mandibular angle variations as well as a four-category classification of severity of platysmal banding. Though helpful as general tools, these scales were not validated and do not delineate the variability into a five-point scale. In the intervening decades, numerous assessment tools, both

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validated and not, have been developed for assessing other areas of the face. Beyond the previously mentioned works, there are not many tools to aid the clinician in assessment of the anterior cervical region.

One of the major components contributing to anterior neck aesthetics is the degree of platysmal banding. To date, however, no validated scales exist in plastic surgery literature that specifically addresses the variable severity of platysmal banding. The anterior neck contributes significantly to the aesthetics of the lower face. In addition, clinical evaluation tools are critical to successful planning and execution of rejuvenation. Therefore, we utilized advanced imaging tools to meet this area of need about aesthetics and planning. The purpose of this study was establish a clinically useful validated platysmal banding scale.

METHODS

Our study was approved by the Institutional Review Board at the Loma Linda University Medical Center (Loma Linda, CA) and conducted in accordance with the guidelines set forth in the Declaration of Helsinki. Utilizing the 3dMD system (Atlanta, GA), 3-dimensional standardized photographs of the cervicomenal region were collected from female volunteer patients of various ages, ethnicities, and body habitus from June 2011 through January 2012. Patients included were females presenting for consultation regarding facial and/or neck rejuvenation who were agreeable to inclusion in the study. Patients excluded were males and females who had undergone any previous surgical intervention or chemical denervation. Informed consent to participate in the study was obtained; all patients expressed understanding of the purpose of the study, the intended application of the photographs, and willingness to participate. The patients for the study were recruited from patients, families, and individuals interested in seeing a 3-dimensional rendition of their face and neck through their enrollment in the study. The 3-dimensional images were examined in detail to establish a proposed classification system for platysmal banding.

Next, the grading scale developed from the images as well as a collection of the volunteer photographs were presented to a validation population, who scored the images based on the scale. The validation process involved the randomization of 49 photographs of the anterior neck with ten different patients’ photographs per grade on the scale. Each photograph was assigned a number in numerical order. These representative numbers were then entered into Microsoft Excel 2010 (Redmond, WA) and randomized through the randomization function. The photographs in their randomized order were printed in a pamphlet and provided as a survey to each rater, who scored the images at their leisure. (A sample copy of the survey is available online as Supplementary Material.) Surveys were distributed in person to all senior-level residents (Post-Graduate Year III and above), clinical faculty, and academic faculty of the Department of Plastic Surgery at the Loma Linda University School of Medicine. Thus, the rater group was comprised of academic and nonacademic attending plastic surgeons as well as senior-level plastic surgery residents. Though no objective assessment of the raters’ experience and skill level was made prior to participation, raters were assumed to be proficient in clinical assessment with adequate skills to evaluate various aspects of neck. However, this assumption does introduce a possible source of bias in the study.

Statistics

After collection, the ratings from the completed surveys were entered into a Microsoft Excel spreadsheet and analyzed for mean, standard deviation, and 95% confidence interval. Next, the data from the validation was analyzed statistically using SPSS through a two-stage process to ensure both interrater and intrarater validity. The first stage was analysis of the Intraclass Correlation Coefficient, or ICC. The ICC was done to determine interrater reliability. ICC values from 0.4 to 0.7 are “fair” to “good” while values from 0.7 to 0.9 are considered “excellent.” Next, intrarater reliability was evaluated utilizing Cronbach’s alpha calculated from the data collected. Cronbach’s alpha values are acceptable if greater than 0.5, but are preferred to be over 0.7.

RESULTS

A total of 119 female volunteer patients were recruited for this study from both patient and nonpatient populations. The patients ranged in age from 24 to 78 years old, with the average age of 49. Largely due to the wide range of ages captured in the study, the volunteers provided a spectrum of cervicomenal aesthetics, with a great variety of platysmal banding severity, for analysis and creation of a grading scale.

The survey results, presented in Table 1, demonstrate the descriptive statistics for all the data collected. For all grades, the 95% confidence interval demonstrates the consistency of the data as there are no overlaps between the intervals or over the various ratings. The tables also contain Intraclass Correlation Coefficients (ICC) for the interrater reliability, calculated for all results that varied from the scale value. Validation of this platysmal banding scale gave results ranging from good to excellent values. This assessment denotes degree of agreement between the various raters, ranging from 0.6 (good) to 0.82 (excellent). The Cronbach’s alpha for each grade further demonstrates validity of the scale, confirming intrarater reliability, or the amount of agreement within each rater’s responses.
Figures 1-5 demonstrate both clinical examples and graphic illustrations of Grade 0 through Grade 4 platysmal banding in the proposed platysmal banding scale. These figures are accompanied by a detailed description of each platysmal banding grade.

DISCUSSION

The anterior neck plays a crucial role in facial rejuvenation, with a major contribution derived from the status of the platysma muscle. The platysma originates from the pectoral and deltoid fasciae inferiorly. It is superficial, rectangular, and encased between the layers of the platysmal fascia. Its insertion is more complex, with some fibers inserting into the mandible while others continue cephalad to insert into various muscles of facial expression, ultimately transitioning to the superficial muscular aponeurotic system (SMAS). Medially, the platysmal muscle anatomy varies in regards to where it decussates, ranging from the fibers completely joining in the suprahyoid region to the fibers traveling straight to the mental protuberance without interlacing. When occurring near the hyoid, the decussating platysmal fibers support the submental region. Absence of the decussation, on the other hand, can leave the medial edge free, contributing a vertical banding anterior neck deformity. It is important to differentiate between a midline decussation and a muscle-based line of tension, known as a platysmal band. The midline decussating edge may be visible horizontally; however, it is not the same entity as a band, and the differentiation is important for treatment purposes. Lower grade true platysmal bands can be addressed by external treatments, such as neurotoxin injection. A visible medial decussation border, on the other hand, generally requires treatment through surgical methods. In addition, the decussation contributes to the width of the platysmal banding. A lower decussation potentially results in narrower banding, necessitating midline plication as a component of a treatment strategy to avoid recurrence. A lack of decussation, on the other hand, can lead to wider banding for which treatment does not always require midline plication as a component.

Aging of the anterior neck, including the severity of platysmal banding, varies greatly between individuals. It is heavily dependent on neck structure, with factors such as skeletal support and body habitus playing a large role in the aesthetics of the aging process. In a patient with a significant amount of neck adiposity, the appearance of

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<th>Table 1. Platysmal Banding Validation Data</th>
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Figure 1. Grade 0 platysmal banding as seen in this 31-year-old female (A) and as an illustration (B). No platysmal bands visible at rest.
platysmal banding is softened by a thicker, more adipose soft tissue envelope. This would then correspond to a less severe grade of platysmal banding on our proposed scale. This scale was developed in a cohort of patients with varying body habitus; however, degree of neck adiposity was not specifically accounted for in this study. While post-platysmal fat will have a minor impact on banding, pre-platysmal submental fat may play significant role in the visibility and diagnosis of platysmal banding and whole neck aesthetics. In patients with a full neck, additional assessment of preplatysmal submental fat pad by pinch, while the platysma is actively being contracted by the patient, could improve the thoroughness of the evaluation. Depending on the amount of preplatysmal fat palpated, the assessment of platysmal banding would have to be adjusted as preplatysmal fat can disguise and dull the appearance of platysmal bands. Similarly, an anteriorly placed hyoid bone may significantly blunt the cervicomental angle and be associated with more prominent submandibular glands, leading to a less defined, more ptotic appearance of the neck and, thus, a more severe grade of cervicomenatal aging.

However, our primary goal is to provide an objective scale of platysmal banding, as this is the key decision point for choosing the type of neck rejuvenation to be performed and few surgical techniques exist to reposition the hyoid, though its position does affect ultimate aesthetic outcome of rejuvenation. Only female patients were studied as females comprise the vast majority of patient who present for neck rejuvenation in our practice. Given the anatomic differences between males and females and the differences in progression...
of aging, a separate scale would likely need to be generated to address cervicomental aesthetics in the male neck.

Multiple components of the anterior neck contribute to the aesthetics, with platysmal banding a prominent undesirable change. The banding appears as vertical bands in the anterior neck secondary to the platysmal muscle fibers separating, atrophying in some areas, and hypertrophying due to hyperactivity in others.15 These vertical lines contribute to the layman’s description of “turkey neck” and can be very distressing to the patients. Techniques done to ameliorate platysmal banding range from injections of botulinum toxin and other closed procedures to surgical plication, interruption, and re-draping in attempts to achieve the desired anterior neck contour.12,16,17 Until the development of this grading scale, there was a deficit of objective tools for measuring both the severity of the platysmal banding and the efficacy of these treatments by outcome.

As new pharmacological and technological medical advances reach the market, we face an increasing array of treatment modalities to improve the aesthetics of the neck and lower face. Reliable methods of evidence-based evaluation of these interventions are crucial to providing us with the ability to discern differences, advantages, and disadvantages among various techniques. In 1996, platysmal band characterization by McKinney defined four classes of bands, with class one being the least prominent and four being severe banding at rest.4 However, further delineation as well as validation of grading scales is crucial to their utilization in evidence-based analysis. Recently, multiple validated assessment scales have been developed for various

Figure 4. Grade 3 platysmal banding as seen in this 71-year-old female (A) and as an illustration (B). Moderate platysmal bands visible at rest along the full length of the neck, elevation at least 5 mm from the surrounding tissue.

Figure 5. Grade 4 platysmal banding as seen in a 68-year-old female (A) and as an illustration (B). Severe platysmal bands along the full length of the neck at rest, elevation at least 5 mm from the surrounding tissue, with additional soft tissue ptotic banding present laterally.
components of the lower third of the face and neck.\textsuperscript{18} A validated assessment tool for platysmal banding, however, has yet to be published in the plastic surgery literature.

We realize that platysmal banding is one of a number of factors that influence the aesthetics of the entire neck. Being a complex 3-dimensional composition of skin, fat, muscle, and bone, the neck is best evaluated by considering the contribution of all these components. We are currently developing a validated assessment tool that incorporates jaw distinction and cervicometanal angle into the evaluation of the entire neck aesthetics.

Another potential limitation of this study was the low response rate to the distributed survey and the potential for nonresponse bias. A total of 22 surveys were distributed, with 12 (54.5\%) returned. However, the average response rate of survey participants to a distributed survey, even among physicians, is known to be in the range of 35\% to 75\%.\textsuperscript{19} Our response rate fell within this range. Furthermore, of those who responded, an even distribution of resident, academic plastic surgeon, and nonacademic plastic surgeon responses was obtained.

Our study, with its validated grading scale, addressed the need for a validated assessment tool for platysmal banding. This scale could be applied to future clinical and research interventions to provide objective grading materials.

**CONCLUSION**

In this study, a validated scale was established to assess the degree of platysmal banding in the female neck. This grading system has potential application in the preprocedure planning for patients considering face and neck rejuvenation and could give clinicians objective criteria by which to grade preoperative appearance and postoperative results.

**Supplementary Material**

This article contains supplementary material located online at www.aestheticsurgeryjournal.com.

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**REFERENCES**