Aesthetic Abstracts and Citations

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In this Aesthetic Abstract and Citations section, we highlight and briefly discuss recently published manuscripts from other peer-reviewed journals that may be of interest to our readership in oculoplastic surgery. These are just cursory reviews to peak an interest on subjects, which the individual reader may desire to pursue in more detail by reading the manuscript in full.

The first 2 articles reviewed are from this month's special supplement in *Plast Reconstr Surg* 2013;132:1S–67S. The supplement focuses on studies and information relevant to the contemporary practice of injecting hyaluronic acid (HA) gel fillers. While these were selected for review, the entire supplement is of value to those interested or involved in eyelid/facial rejuvenation with HA gels.

Sundaram H, Cassuto D. Biophysical characteristics of hyaluronic acid soft-tissue fillers and their relevance to aesthetic applications. *Plast Reconstr Surg* 2013;132:5S–21S.

Numerous reports have substantiated that facial aging changes involve not only changes in skin quality/texture and tissue descent but also loss of facial tissue volume, including fat and bone (via normal involutional deflation and bone remodeling). From this critical concept, it has become apparent that volume restoration/augmentation and facial soft-tissue recontouring can restore a youthful appearance. Over the last decade, injectable hyaluronic acid gel fillers (HAGFs) have become a standard means of achieving this goal. Like with all new interventions, much has been learned since 2003 when the first HAGF (Restylane) was FDA approved in the United States. Early on, HAGFs were indiscriminately injected to fill folds and lines. Little was known about the importance of differences in their biochemical makeup and how these differences could be used advantageously. While HAGFs generally demonstrate excellent safety and efficacy profiles, with a low incidence of complications, persistent edema, contour irregularities, and tissue discoloration (Tyndall effect) can occur, often requiring the injection of a dissolving agent (exogenous hyaluronidase) to address such problems. Injection-related complications may be reduced, and enhanced aesthetic outcomes achieved, with an appropriate understanding of certain physical/chemical properties of the various HAGFs.

In this article, the authors review data (new and old) on biophysical properties of well-established HAGFs—the NASHA (non animal stabilized hyaluronic acids) group—Restylane and Perlane (Medicis/Valeant, Bridgewater, NJ, U.S.A.), the Hylacross group —Juvederm family (Allergan Inc, Irvine, CA, U.S.A.), and the cohesive polydesified matrix (CPM) group—Belotero Balance (Merz Pharmaceuticals, Greensboro, NC, U.S.A.). The groups are named according to their manufacturing (cross-linking) process. In its pure form, HA would degrade quickly after implanation. By the process of cross-linking, the molecule becomes stable and allows longevity of effect. While gel concentration and cross-linking allows for stability and longevity of the product, the higher concentration fillers (Juvederm family) can lead to prolonged periorbital swelling (hydrophilic response).

The emphasis in this report is on rheologic (elasticity and flow measurement) data of the various HAGFs. There are 2 clinically relevant gel parameters described. The first, the elastic modulus or G', is a measure of the gels' stiffness or ability to avoid deformation. A high G' gel promotes tissue 3-dimensional vectoring and elevation and is a gel that tends toward stability against the forces of gravity and facial movement. These are excellent fillers for deeper subdermal and preperiosteal placement (volume augmentation and lifting). Low G' fillers are less stiff and with less lifting potential and are better suited for more superficial filling. The high G' fillers are Perlane and Restylane, the intermediate G' fillers are the Juvederm family, and the low G' filler is Belotero Balance.

The other critical clinical rheologic gel parameter elaborated on is gel viscosity, or the gels' ability to spread once injected. Like with the G', Perlane and Restylane are high viscosity gels (resist tissue spreading); the various Juvederm gels are of intermediate viscosity, while Belotero is a low viscosity product. The low viscosity nature of Belotero allows for its injection intradermally to efface fine lines. This has not previously been reported with standard HAGFs without gel modification (dilution). The data described in this report is from in vitro analysis and cannot be definitively extrapolated to the in vivo state. However, the authors also present human histopathologic and ultrasound evidence that substantiates the various gel's rheologic tendencies. A concise explanation, written and diagrammatic, of why and how the Tyndall response (blue coloration created by the gel) occurs when a clear gel is implanted, is also presented.

Message: This is a well-written report that every HA gel injector should read and become familiar with. This is especially true for periocular injections, as this area of the face is not forgiving of incorrect gel, or depth of gel, placement. The concept of sandwiching deeper high G' filler (i.e., Restylane) as a foundation with overlying low G' filler (i.e., Belotero) as a more superficial adjunct is described. This reviewer has found this combination to be very effective in his personal experience. Nice charts and diagrams provide an explanation of the various gel properties described.

Micheels P, Sarazin D, Besse S, Sundaram H, Flynn TC. A Blanching technique for intradermal injection of the hyaluronic acid Belotero. *Plast Reconstr Surg* 2013;132:59S–68S.

The authors describe an intradermal "blanching" injection technique for a low G' and viscosity HA gel filler, Belotero Balance (Merz Pharmaceuticals, Greensboro NC, U.S.A.), for the treatment of facial fine lines. Previous recommendations with Restylane, Perlane, and the Juvederm family of fillers were to inject these products subdermally or deeper to avoid clumping, nodules, other contour irregularities, and the potential for the Tyndall effect. These gels are manufactured (cross-linked) in a

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Accepted for publication November 28, 2013.

The authors have no financial or conflicts of interest to disclose.

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DOI: 10.1097/IOP.0000000000000094

way that creates physical properties that increase the incidence of these complications when injected superficially. Belotero (called Belotero Balance in the United States and Belotero Basic in Europe) is cross-linked in a biphasic manner that allows for better dermal integration and a more even and cohesive spread of the filler, which allows for safer superficial dermal injection.

The authors injected 6 patients with a technique previously described for superficial intradermal injection of filler. This consists of a tangential (10°) injection of filler with a 30-gauge needle superficially while tenting up the skin with the needle (Bevel up or down depending on skin thickness). Serial microinjections were given rather than the more common retrograde injection technique for deeper filler placement. The micodeposit of superficial filler led to a whitening or "blanching" of the skin. This was not believed to be related to vasoconstriction, but rather to the transparent nature of the gel in close proximity to the skin surface, or tissue distention with blood displacement. The lead author has used this technique in over 800 patients over a 7-year period without significant complications. In addition, 2 patients consented for punch biopsy after injection for histopathologic evaluation of tissue specimens. Finally, all patients had ultrasound evaluation of the depth and angle of needle injection and of gel placement within tissue.

The data revealed that, in fact, the depth of needle penetration was in the superficial reticular dermis, and that the angle of injection was in line with what was assumed (approximately 10°–12°). Tissue histopathology showed that the injected gel was distributed consistently across the reticular dermis with minimal inflammatory response. The injection technique reveals the aforementioned temporary blanching (lasts approximately 10 minutes) and should be followed by molding of the area for a smooth final correction. The authors present 2 patients posttreatment and report maintenance of fine line effacement at 1- and 2-year follow up. Finally, the authors stress that although the short-lived tissue blanching with superficial injection of Belotero as described is safe, blanching is a troublesome sign for deeper particulate injections, possibly indicating vascular compromise.

Message: This article reports a safe, superficial injection technique with cohesive polydensified matrix hyaluronic gel filler (Belotero) for facial fine lines. This information is valuable to the clinical injector as it eliminates the need to dilute standard HA gels for this purpose. Familiarization with this technique is made simple and straightforward with the article's description.

Kim SS. Effects in the upper face of Far East Asians after Oriental blepharoplasty: a scientific perspective on why Oriental blepharoplasty is essential. *Aesth Plast Surg* 2013;37:863–8.

Blepharoplasty surgery affects more than just the appearance of the eye. By altering secondary dynamic action of the adjacent frontalis muscle, the position of the brows can also be altered. While such changes have been described before, this has not previously been studied in depth in an oriental patient population. The authors describe their experience with observations regarding upper facial changes after blepharoplasty surgery from 1992 to 2006, in 2896 young Korean patients. Measurements of upper facial parameters were assessed by retrospectively evaluating before and after digital photographs in 612 of these patients (598 women and 14 men) who met inclusion criteria (see details in manuscript). The mean patient age is 22.4 years, and follow up is 13.8 months. The patient pre- and postoperative photographs were standardized by measuring the outer limbus to limbus distance in each set and adjusting photograph size as needed. Three measurements were evaluated. These included the height of the palpebral fissure (HPF), the distance between the highest point of the palpebral fissure of the upper eyelid and the eyebrow (DEE), and the distance between the eyebrow and the hairline (DEH). After surgery, there was a significant increase in both the HPF (11.8%) and the DEH (4.9%). There was a reciprocal decrease in the DEE of 14%. In patients without preoperative double eyelids, these changes were slightly greater than in those with preoperative double eyelids. Patients were also divided into 4 groups based on length of follow up (6-month increments). The percent changes in measured variables were consistent in each subgroup. The overall results in this report showed that there was a statistically significant inverse relationship between the DEE (reduction) and the DEH (increase) in both patients with and without preoperative double eyelids.

It is interesting to note that there were 20 patients who had >1 set of postoperative photographs taken. In this group, it was found that when photographs were taken prior to 6 months after surgery and then 6 months later, the HPF and DEH increased slightly more. This may suggest that it takes >6 months for the eyelids and eyebrows to reposition themselves after surgery.

Message: This is an interesting study demonstrating how brow position can change after blepharoplasty surgery. Of particular interest is that this study was performed in a young patient population, demonstrating a reduction in frontalis drive to raise the brows when significant involutional change has yet to manifest.

Yang C, Zhang P, Xing X. Tear trough and palpebromalar groove in young versus elderly adults: a sectional anatomy study. *Plast Reconstr Surg* 2013;132:796–808.

Clinically, the nasojugal groove (NJG or tear trough) lies over and just below the inferior orbital rim, starting adjacent to the medial canthus and terminating at the mid-pupillary line. The palpebromalar groove (PMG) or orbitomalar groove (OMG), or what the authors refer to as the eyelid/cheek junction, is a continuation of this depression to the lateral canthus. Theories as to the development of the tear trough include relaxation of tissue from above (skin, muscle, and fat), ligamentous attachment/connection of the orbicularis to the orbital rim (so-called tear trough ligament), volume deficit over the orbital rim, and mid-facial ptosis. Similar changes underlie the development of the PMG. As there has been a paucity of detailed study in this area, the authors proceeded with this observational anatomical report that suggests a basis for the development NJG and PMG. Sagittal layered dissection was performed on 20 older (all over 60 years) cadaveric hemifaces with obvious NJGs and PMGs, and in 16 young (all <30 years) hemifaces without obvious periorbital depressions. A long axis vertical point of reference ran perpendicular to the inferior orbital rim (superior to inferior). Two horizontal lines (perpendicular to reference line) were then marked: I at the level of the inferior orbital rim, and II at the level of the superior most point of the malar fat pad. The distance from line I to II was then identified.

Pertinent findings are that in younger patients the upper malar fat pad projects above the orbital rim, while in the elderly, the opposite is true (average difference 3.5 mm—found to be statistically

significant). Histology showed this to be due to loss of fat and tissue descent. The orbicularis retaining ligament (ORL) originates from the infraorbital rim and attaches to the junction of the palpebral and orbital orbicularis muscle at an area topographically consistent with the clinically apparent NJG (this may be the "tear trough" ligament) and PMG. The ORL underlying the PMG is longer, more porous, and elastic than that associated with the NJG. This ligament has no direct attachment to skin as previously thought. The suborbicualris oculi fat (SOOF) is not present in the area of the NJG but is robust below the PMG. The SOOF did not change appreciably between the young and old.

From the results, the authors surmise that tissue relaxation, descent, and volume loss all play a role in the development of the NJG and PMG. However, volume loss and ptosis is of the malar fat pad (not the SOOF) and restriction of eyelid tissue descent from above (orbicularis muscle and fat) by the ORL are critical features. This brings up interesting points regarding effacement of the NJG and PMG. There are 2 general options: filling (fillers or fat) and surgery. Surgeons and injectors fill deep in this area to avoid contour issues, yet volume loss in this study was of superficial fat (malar fat pad). This may be why results are often limited with this means of treatment. Surgery should involve release of the ORL with fat transposition. The authors suggest ORL release may reduce eyelid support and lead to eyelid retraction, especially in the setting or prominent globes or eyelid laxity. Adjunctive canthal suspension is recommended in these cases.

Message: There are many theories as the etiology of the NJG and OMG. All involve some combination of herniation of tissue from above, volume loss, tissue descent, and possibly a tether at the orbital rim. This is a nice anatomical study that identifies volume loss and descent of the malar fat pad and the anatomical characteristics of the ORL as major culprits, leading to the development of these periorbital hollows. The literature in this area continues to evolve. It is important to stay current on these ideas for those operating on this complex and controversial area of the face.

Core GB. Lateral access recontouring blepharoplasty for rejuvenation of the lower lids. *Plast Reconstr Surg* 2013;132:835–42.

The author describes a novel means of addressing mild to moderate typical involutional changes associated with the lower eyelid/cheek aesthetic unit. These changes include relative eyelid fat herniation, septal attenuation, the development of a nasojugal groove, and mid-face descent. The authors stress that traditional transcutaneous and transconjunctival (although less so) surgery put the patient at risk of eyelid malposition (retraction) by means of violating the orbicularis muscle, orbital septum, and/or lower eyelid retractors.

The surgery consists of a lower blepharoplasty accessed via a modified lateral skin/muscle canthotomy, through which sharp and blunt suborbicularis/preseptal dissection (aided by a Senn and/or Aufricht retractor) ensues medially to the canthus, and inferiorly below the orbital rim, with release of the orbitomalar ligament, until mid-face fat is identified. The nasal and central lower eyelid fat compartments are accessed through the canthal entry port by buttonholing the inferior orbital septum. The fat is then teased out and secured to mid-face fat with an externalized or internal suture. The lateral fat can be excised or redraped depending on clinical findings. The lateral presepetal orbicularis muscle is then lifted and suspended to the deep temporal fascia. A true canthal suspension is added as needed. All suspension adjuncts are performed through a temporal eyelid crease access created during associated upper blepharoplasty (if performed), or through a de novo similar incision if upper blepharoplasty is not added. Eighty-nine patients (86 women) ranging from 45 to 62 years underwent surgery with an average 18-month follow up. There were only 2 minor complications consisting of 1 suspension suture nodule and 1 scar, both requiring minor revision. All patients were very satisfied, assessed by simple questioning or spontaneous patient expression. The author stresses that this technique addresses aged-related eyelid deficits (fat herniation), with the addition of filling (the NJG with transposed native eyelid fat) and lifting (orbicularis muscle and indirectly mid face) to comprehensively address the lower eyelid and its transition to the mid face without violating critical eyelid tissue planes that can lead to postoperative complications. The author also grades lower eyelid aging changes in stages 1,2,3, with 3 being more severe (skin excess, obvious eyelid laxity). The study consisted of only stage 1 and 2 patients. Stage 3 patients are excluded as they would need more significant interventions.

Message: This reviewer is a bit puzzled as to the emphasis that transconjunctival surgery and division of the lower eyelid retractors (that the author mistakenly refers to as separate from the capsulopalpebral fascia) can lead to eyelid malpostion. This should be exceedingly rare. Also, the mid-face fat described, which the eyelid fat is secured too, is not anatomically defined. It appears to be the SOOF in description and surgical drawings. As there is not more than remnants of a SOOF layer nasally, what mid-face fat layer is the nasal eyelid fat secured too? Finally, while an interesting and intriguing approach, it seems cumbersome to perform all these maneuvers through such a small access distant from the site of these important surgical steps. This may not prove to be as difficult once the procedure is attempted. The before and after photos presented and the surgical drawings are excellent. It would have been nice to have a more formal evaluation of patient satisfaction. The article is worth reading and evaluating.