Minimally Invasive Aesthetic Treatment of the Face and Neck Using Combinations of a PCL-Based Collagen Stimulator, PLLA/PLGA Suspension Sutures, and Cross-Linked Hyaluronic Acid

Background: Combinations of minimally invasive procedures (MIPs) are often used in aesthetic treatments and are increasingly considered as the new standard of care. Three agents with specific properties are available in this perspective: a polycaprolactone (PCL)-based collagen stimulator, a poly-L-lactic acid (PLLA)- and a poly-glycolic acid (PLGA)-based resorbable suspension suture with a 3D-cone technology, and a cross-linked hyaluronic acid (HA).

Objective: To develop the first practice guidelines on rejuvenation treatment of the face and the neck using combinations of these agents, whether associated or not with other widely used MIPs such as botulinum neurotoxins or energy-based devices.

Methods: A multi-disciplinary, multi-national board of plastic surgeons and dermatologists convened to develop guidelines using a predefined consensus method. The consensus was defined as ≥83% agreement rate between participants.

Results: Practice guidelines and algorithms, describing optimal procedure sequence and spacing, are proposed for the treatment of upper-, mid-, lower-face and neck, combining the PCL collagen stimulator, the PLLA/PLGA suspension sutures, and the cross-linked HA, whether associated or not with other MIPs.

Conclusion: These new guidelines provide general support to optimal management strategies. Individual treatment plans should be adapted according to the physician’s individual competence and the patient’s preferences.

Keywords: botulinum toxins, combined modality therapy, dermal fillers, energy-based device, practice guideline, rejuvenation

Introduction

Since the appearance of skin and face are considered important factors of well-being and health, the number of aesthetic procedures performed worldwide is continuously increasing. For instance, according to the American Society of Plastic Surgeons, 17.7 million surgical and minimally invasive cosmetic procedures were performed in the United States (US) in 2018.

In this context, the use of minimally invasive procedures (MIPs) increased strongly by +228% growth rate between years 2018 and 2000 in the US, and MIPs represent now nearly 90% of aesthetic interventions. They aim to attain optimal results with minimal invasiveness, faster recovery, reduced scarring, limited

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stress, and better patient satisfaction.\textsuperscript{5} They include a wide range of injectable agents, devices, and techniques, each being performed in precise indications. The most often used injectable agents are the \textit{Clostridium botulinum}-derived botulinum neurotoxins (BoNTx), which induce a temporary relaxation of muscles,\textsuperscript{6} and hyaluronic acid-based (HA) biodegradable soft-tissue fillers.\textsuperscript{7,8} Other biodegradable fillers, based on calcium hydroxylapatite (CaHA), polycaprolactone (PCL) or poly-L-lactic acid (PLLA), possess additional bio-stimulatory properties.\textsuperscript{9–11} The term “energy-based devices” (EBDs) encompasses different purposes and devices, ie, tightening (micro modelling) vs resurfacing techniques. Commonly used EBDs in face and neck rejuvenation are radio frequency (RF) for skin tightening and collagen contraction, skin resurfacing lasers, and high-intensity focused ultrasound (HIFU) for wrinkle reduction and skin tightening.\textsuperscript{6,12–15} While mechanical liposuction and chemical lipolysis are used for fat reduction, intense pulsed light (IPL) is used for improving skin colour and texture.

Combination Treatments: The New Standard of Care

MIPs are increasingly utilised in combination protocols to improve outcomes.\textsuperscript{16} In 2014, nearly half of all aesthetic patients in the US who requested MIPs received multiple procedures.\textsuperscript{4} Indeed, combination treatments offer an optimal response to the multifactorial process of facial ageing, which involves structural changes in all anatomical layers (bone, muscles, ligaments, adipose tissue, and skin) and dynamic interactions among these tissues.\textsuperscript{2,17,18} Consequently, the modern concept of natural and harmonious rejuvenation is based on a comprehensive, three-dimensional, multi-layered approach, combining multiple agents and techniques to attain multiple goals such as relaxation, volumisation, volume repositioning, reshaping, resurfacing, or tightening, depending on specific patient needs.\textsuperscript{6,17,19}

Diverse multimodal approaches have been assessed for face and neck rejuvenation in clinical studies (Table 1). The studies have generally concluded that combination treatments display additive or even synergistic effects, leading to better and longer-lasting results compared to single agent- or single technique-based protocols, with no clinical evidence of increased adverse events (AEs) rate or severity.\textsuperscript{6,16,20–22} Therefore, combined treatments are now considered the new standard of care.\textsuperscript{18}

### Table 1 Published Multimodal Approaches Proposed for Face or Neck Rejuvenation

<table>
<thead>
<tr>
<th>Face</th>
<th>Neck (†Decolletage)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RCTs (n Patients)</strong></td>
<td></td>
</tr>
<tr>
<td>HA filler + RF vs HA filler (n = 10)\textsuperscript{57}</td>
<td>BoNTx + HA filler + MFU-V (or CaHA) (n = 10)\textsuperscript{56}</td>
</tr>
<tr>
<td>BoNTx + HA filler vs BoNTx (n = 20)\textsuperscript{58}</td>
<td>BoNTx + HA filler + MFU-V (or CaHA) (n = 10)\textsuperscript{56}</td>
</tr>
<tr>
<td>BoNTx + HA filler vs BoNTx + HA filler + cosmetic treatment (n = 20)\textsuperscript{59}</td>
<td>CaHA + MFU-V (n = 47)\textsuperscript{64}</td>
</tr>
<tr>
<td>BoNTx + HA filler vs BoNTx vs HA filler (n = 90)\textsuperscript{60}</td>
<td>BoNTx + CaHA + HA filler + MFU-V (n = 101)\textsuperscript{65}</td>
</tr>
<tr>
<td><strong>Non-Randomized Studies and Case Reports (n Participants)</strong></td>
<td></td>
</tr>
<tr>
<td>HA filler + RF + (n = 1)\textsuperscript{61}</td>
<td></td>
</tr>
<tr>
<td>BoNTx + HA filler + laser resurfacing (n = 1)\textsuperscript{62}</td>
<td>BoNTx + HA filler + MFU-V (or CaHA) (n = 10)\textsuperscript{56}</td>
</tr>
<tr>
<td>BoNTx + CaHA + HA filler + injectable PLLA (n = 2)\textsuperscript{20}</td>
<td>CaHA + MFU-V (n = 47)\textsuperscript{64}</td>
</tr>
<tr>
<td>BoNTx + CaHA + HA filler + MFU-V (n = 101)\textsuperscript{65}</td>
<td></td>
</tr>
<tr>
<td>BoNTx + HA filler (n = 60)\textsuperscript{66}</td>
<td>BoNTx + CaHA + HA filler + MFU-V (n = 101)\textsuperscript{65}</td>
</tr>
<tr>
<td>Bimatoprost\textsuperscript{a} + BoNTx + HA filler (n = 116)\textsuperscript{16}</td>
<td></td>
</tr>
<tr>
<td><strong>Reviews</strong></td>
<td>Various techniques\textsuperscript{b} \textsuperscript{52}</td>
</tr>
<tr>
<td>BoNTx + HA filler + various EBDs (laser, IPL, MFUS, FMR)\textsuperscript{22}</td>
<td></td>
</tr>
<tr>
<td>BoNTx or HA fillers + IPL + lasers (ablative and non-ablative) + RF\textsuperscript{57}</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:** \textsuperscript{a}Bimatoprost 0.3% ophthalmic solution; \textsuperscript{b}ATX-101, ablative and non-ablative fractional lasers, BoNTx, cryolipolysis, HA fillers, IPL, laser lipolysis, liposuction, MFU-V, monopolar RF.

**Abbreviations:** BoNTx, botulinum neurotoxin; CaHA, calcium hydroxylapatite; FMR, fractional microneedle radiofrequency; HA, hyaluronic acid; IFU, intensity focused ultrasound; IPL, intense pulsed light; MFUS, micro-focused ultrasound; MFU-V, micro-focused ultrasound with visualization; PLLA, poly-L-lactic acid; RCT, randomized controlled trial; RF, radiofrequency; US, ultrasound.

PCL Collagen Stimulator, PLLA/PLGA Suspension Sutures, Cross-Linked HA

Three distinct agents have been proposed by a single company (Sinclair Pharmaceuticals, London, UK) for minimally invasive rejuvenation treatments: a biodegradable collagen stimulator (Ellanse\textsuperscript{8}), a resorbable suspension suture with a 3D-cone technology (Silhouette Soft\textsuperscript{9}), and a cross-linked HA (Perfectha\textsuperscript{8}).

The collagen stimulator is composed of bioresorbable PCL microspheres suspended in an aqueous carboxymethylcellulose gel carrier. In addition to their soft-tissue filler effect, the microspheres stimulate the production of new collagen,\textsuperscript{11,23} resulting in volume restoring, face...
Table 2 Sinclair Pharmaceuticals Products for Minimally Invasive Rejuvenation

<table>
<thead>
<tr>
<th>Product Range</th>
<th>PCL Collagen Stimulator*</th>
<th>PLLA/PLGA Suspension Sutureb</th>
<th>Cross-Linked HAc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concept</td>
<td>Dermal filler stimulating collagen production</td>
<td>3D cone-based suspension suture</td>
<td>Cross-linked resorbable high molecular weight HA gel</td>
</tr>
<tr>
<td>Indications</td>
<td>Volume restoration</td>
<td>Facial and neck contour reshaping</td>
<td>Wrinkle correction</td>
</tr>
<tr>
<td></td>
<td>Facial reshaping</td>
<td>Tissue repositioning</td>
<td>Volume restoration</td>
</tr>
<tr>
<td></td>
<td>Skin quality improvement</td>
<td>Collagen stimulation</td>
<td>Facial contouring</td>
</tr>
<tr>
<td>Product range</td>
<td>3 Products</td>
<td>3 Products</td>
<td>5 Products</td>
</tr>
<tr>
<td></td>
<td>• ≥18 Months</td>
<td>• 8 Cones</td>
<td>• BDDE cross-linked HA gels (20 mg/mL)</td>
</tr>
<tr>
<td></td>
<td>• 24 Months</td>
<td>• 12 Cones</td>
<td>• Variable particle sizes</td>
</tr>
<tr>
<td></td>
<td>• 36 Months</td>
<td>• 16 Cones</td>
<td></td>
</tr>
<tr>
<td>Duration of effect</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: *Ellanse®; Silhouette Soft®; Perfechta®; *Expected longevity in vivo based on extrapolation of clinical data from S and M versions and accepted PCL degradation behavior.

Abbreviations: BDDE, butanediol diglycidyl ether; HA, hyaluronic acid; PCL, polycaprolactone; PLLA/PLGA, poly-L-lactic acid/poly-glycolic acid.

Rejuvenation treatments: from superficial or deep lines filling to volume creation and contour shaping. Clinical studies have shown their efficacy, lasting for six to 18 months, as well as a high level of patient and physician satisfaction. Devoid of inflammatory effects, these cross-linked HA gels are safe in daily clinical use as evidenced by a post market survey (2012–2019) that found a 0.0239% AEs rate out of 2.8 million syringes sold worldwide.

In daily practice, the PCL collagen stimulator, the PLLA/PLGA suspension sutures, and the cross-linked HA are most often combined in multimodal rejuvenation protocols. As no specific recommendations existed to guide this frequent practice, the objective of the present work was to provide physicians with guidelines on the optimal use of these agents in combination in face and neck rejuvenation treatments.
Methods
The guidelines were developed by a multi-disciplinary, multi-national board of plastic surgeons and dermatologists representing a worldwide perspective. As an initial step, each participant was asked to independently indicate personal preferences concerning the best-combined rejuvenation treatment of predefined target areas (neck, lower face, mid-face, and upper face) using a common standardized questionnaire. Participants were also asked to analyze frequent aesthetic problems separately within each area (eg, for lower face: loss of jawline contour, loss of submental cervical angle, and so on) in patients with mild or moderate to severe signs of aging. Individual preferences were compiled in anonymized summary tables, which were presented for discussion at a consensus meeting. All options were submitted to plenary votes to identify formal consensual statements according to the following criteria:

1. Agreement of six out of six experts: strong consensus,
2. Agreement of five out of six experts (83% agreement): consensus,
3. Agreement of ≤four/six experts: absence of consensus.

Results and Recommendations
The board commented on the initially proposed analytical approach, objecting that the adjectives “mild”, “moderate”, and “severe” are vague and subjective: a patient may well be sorted in different categories by different physicians. Thus, this approach cannot be used unless based on a validated and widely accepted (visual) scale. Moreover, differences in patient management according to severity are often only a matter of the number of sessions and product amounts, not different strategies. The focus on individual aesthetic unit problems within the same face area appeared superfluous and irrelevant: in daily practice, most patients are treated by combination protocols for more than one mutually correlated aesthetical problems within the same area.

However, a series of key orientations to categorize the usual problems and manage combination treatments were consensually agreed.

Guidelines on Common Key-Principles
It is not advisable to perform multiple procedures on the same area during the same session because scant data are available on possible interactions, making it difficult to accurately incriminate the responsible agent/procedure in case of an emergent AE. However, the board members acknowledged that they do not always follow this rule, assuming thereby increased personal responsibility and that no complications may arise from combining different treatment modalities in different anatomical areas during the same session.

As a rule, the rejuvenation protocol should successively aim for two main objectives: volume adjustment (reduction, replacement/augmentation or creation) in the first place, tissue reposition afterwards. A frequently needed optional final step aims at improving the overall result performing “touch up” and skin quality improvement procedures. Regarding volume replacement, the board favours the PCL collagen stimulator, as it offers an additional long-term rejuvenating effect by stimulating neocollagenesis, but HA fillers, as per the treating physician preference, can also be used.

Volume (fat) reduction can be performed by any physician’s preferred usual technique (laser-assisted lipolysis, chemical lipolysis solution, liposuction, HIFU). Most board members recommend performing fat-reduction before PLLA/PLGA sutures insertion (respecting an interval of six to eight weeks after injection lipolysis, and a 12-week interval after liposuction or cryolipolysis); one participant prefers applying injection lipolysis two weeks after sutures insertion.

The PLLA/PLGA suspension sutures should be placed according to the currently recommended straight patterns, strictly avoiding the “U” and the angle (“L”) patterns. The number of sutures implanted in every target area should be sufficient to induce optimal effect and patient satisfaction.

BoNTx injections are always recommended for eyebrows and neck rejuvenation, where they should be performed two weeks before the PLLA/PLGA sutures insertion, since complete muscular relaxation allows better cones encapsulation and a more stable effect (see the “blanket statement” in Table 3). Their use is optional in other areas where they are often injected before or during the same session as volume replacement.

The cross-linked HA fillers or the PCL collagen stimulator may also be injected as an elective last step, designed to improve the final result, thanks to a “touch up” effect, ie, fine-line/wrinkle correction, skin quality improvement and beautification (eg, lip enhancement/augmentation, additional volume augmentation, and so on).
**Upper Face**

The overall upper-face rejuvenation procedure (sequence and spacing) was agreed with a strong consensus level. It starts with systematic BoNTx injections, associated with volume replacement. The sequence then differs depending on whether further tissue reposition (eyebrows elevation) is based on either cross-linked HA or PCL collagen stimulator injections (Figure 1A) or on 8-cone PLLA/PLGA sutures insertion (Figure 1B). The final touch-up/ refinement session is optional.

**Mid-Face**

Mid-face rejuvenation treatment starts with volume replacement, followed by tissue reposition (Figure 2); agreement level: strong consensus. The third “touch up” step is optional and should not be performed before the results of the previous steps are stabilized.

**Lower Face**

The overall lower-face rejuvenation procedure, starting with volume adjustment (reduction or replacement/augmentation) is described in Figure 3. A minor discrepancy existed between board members regarding the preferred sequence of injection lipolysis and the PLLA/PLGA sutures insertion: starting with injection lipolysis was the consensually adopted choice, but one participant preferred the reverse sequence; (overall agreement level: consensus). The BoNTx-based muscular relaxation (“Nefertiti lift”49,50) is optional and, when needed, should be separated by a two-week interval with the next step (tissue reposition, suture insertion). The last (fourth) “touch up” step is also optional.

**Neck**

The two- to four-step neck rejuvenation treatment may start with either an optional volume reduction, an optional EBD tightening or a systematic BoNTx-based platysma relaxation (Figure 4); overall agreement level: consensus. When performed, the EBD tightening should be separated by a long enough interval with the PLLA/PLGA sutures insertion (tissue reposition). Finally, an optional fifth step (dermal filler injections according to its instructions for use, two weeks after sutures insertion) may be needed to perfect the results.

**Discussion**

We propose here the first recommendations on the multimodal rejuvenation treatment of the face and neck involving three specific agents, ie, the PCL collagen

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**Table 3** Focus on Important Treatment Spacing Principles

<table>
<thead>
<tr>
<th>Combined Use of EBDs and PLLA/PLGA Suspension Sutures</th>
</tr>
</thead>
<tbody>
<tr>
<td>• EBD tightening techniques should be used 6–8 weeks before (preferably) or 8–12 weeks after the PLLA/PLGA sutures insertion.</td>
</tr>
<tr>
<td>• Resurfacing techniques should be performed 2–4 weeks before or after (preferably) the PLLA/PLGA suspension sutures insertion.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Combined Use of BoNTx and PLLA/PLGA Suspension Sutures</th>
</tr>
</thead>
<tbody>
<tr>
<td>• BoNTx injection should be performed 2 weeks before PLLA/PLGA sutures insertion.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Optional Touch Up Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Should be injected 4–6 weeks after initial volume replacement/augmentation when using the PCL collagen stimulator, or 2 weeks after initial filler treatment when using the cross-linked HA.</td>
</tr>
</tbody>
</table>

**Abbreviations:** BoNTx, botulinum neurotoxin; EBD, energy-based device; HA, hyaluronic acid; PLLA/PLGA, poly-L-lactic acid/poly-glycolic acid.
stimulator, the PLLA/PLGA suspension sutures, and the cross-linked HA. Such recommendations are needed because previously published consensuses have been focused on the separate use of the PCL collagen stimulator\(^3^4\) or the PLLA/PLGA suspension sutures only,\(^4^0\) while combination treatments are commonly used in daily practice and may lead to serious problems if followed inappropriate sequencing or spacing (eg, unfavourable interaction between EBD techniques and the PLLA/PLGA sutures). We believe that our recommendations are reliable as they are designed by a multidisciplinary group of experienced physicians, are based on a formal consensus method, and only propose attitudes supported by a high agreement rate. However, the

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Figure 1 (A) Algorithm for upper-face rejuvenation when using cross-linked HA or PCL collagen stimulator injections for eyebrow elevation. (B) Algorithm for upper-face rejuvenation when using PLLA/PLGA sutures for eyebrow elevation.

**Note:** Spacing between steps 2 and 3: 4–6 weeks if step 1 treatment was PCL Collagen stimulator or 2 weeks if step 1 treatment was cross-linked HA.

**Abbreviations:** BoNT, botulinum neurotoxin; HA, hyaluronic acid; PCL, polycaprolactone; PLLA/PLGA, poly-L-lactic acid/poly-glycolic acid.
1. VOLUME REPLACEMENT

- PCL collagen stimulator
- Cross-linked HA

2 weeks

2. TISSUE REPOSITION

- PLLA/PLGA sutures

Spacing according to step 1 treatment

3. TOUCH UP (optional)

Cross-linked HA
Collagen stimulator

Figure 2 Algorithm for mid-face rejuvenation.

Note: Space between steps 2 and 3: 4–6 weeks if step 1 treatment was PCL Collagen stimulator or 2 weeks if step 1 treatment was cross-linked HA.

Abbreviations: BoNT, botulinum neurotoxin; HA, hyaluronic acid; PCL, polycaprolactone; PLLA/PLGA, poly-L-lactic acid/poly-glycolic acid.

1. VOLUME ADJUSTMENT

1.1. VOLUME REPLACEMENT/AUGMENTATION

- Cross-linked HA
- PCL collagen stimulator

Same session

1.2. VOLUME REDUCTION

- Liposuction and cryolipolysis
- 12 weeks

2. RELAXATION (optional)

Masseter, DAO, Mentalis, Platysma

- Injection lipolysis
- 6 to 8 weeks

BoNT

2 weeks

3. TISSUE REPOSITION

- PLLA/PLGA sutures

- 2 weeks

4. TOUCH UP (optional)

Cross-linked HA
PCL Collagen stimulator

2 to 6 weeks

Figure 3 Algorithm for lower-face rejuvenation.

Note: Space between steps 3 and 4: 2 weeks if step 1.1 is cross-linked HA, or 4 to 6 weeks if step 1.1 is PCL collagen stimulator.

Abbreviations: BoNT, botulinum neurotoxin; DAO, depressor anguli oris; HA, hyaluronic acid; PCL, polycaprolactone; PLLA/PLGA, poly-L-lactic acid/poly-glycolic acid.
US-based board member could not directly comment on the fillers that are not approved by the Food and Drug Administration (FDA) but extrapolated recommendations from the use of FDA-approved fillers. Finally, our recommendations account for a wide range of other commonly used agents and techniques, rendering them probably relevant and helpful in daily practice.

We have deliberately designed our consensus as general guidelines on the best management strategy and not as detailed recommendations on precise problems. This is because the addressed practice field encompasses nearly an infinite number of individual problems. Like all other authors, we acknowledge that such guidelines are never enough – they provide only general support, not an individualized treatment plan. The optimal treatment plan always results from a physician’s individual knowledge (anatomy, aging physiology, product characteristics), training (injection or insertion techniques), general clinical competence, responsibility, and wisdom combined with the patient’s values and preferences.\(^{17,34}\)

Comparable consensus guidelines have also most often specified their recommendation according to separate areas (eg, upper, mid-, and lower face, neck), the type of injected agents or EBDs, and the treatment sequence and timing (Table 4).\(^{6,18,51}\) The importance of spacing different treatments (at least one to two weeks) on the same area was generally highlighted to allow the resolution of local side-effects and reliably assess efficacy results and potential AEs.\(^{6,51}\) While some injectable agents (BoNTx, HA, CaHA) can safely be used on the same day and in any sequence, EBDs (MFU-V) should be delivered on a separate occasion, preferably before filler injection.\(^{6,18,51}\)

The main limitations of our guidelines pertain to the drawbacks associated with the expert consensus method and the lack of population specificity. Indeed, it has been emphasized that ethical guidelines should be evidence-based, ie, derived from randomized controlled trials (RCTs) and meta-analyses of RCTs, which bear low risk for bias.\(^1\) However, RCTs are very rare in the rejuvenation and beautification domain, especially regarding multi-modal management.\(^{52}\) Thus, as a rule, guidelines on combination treatments have been based on expert consensus, as are ours.\(^{6,16,18,51,53,54}\) Compared to these sources, we have used fairly stringent consensus criteria. It has been acknowledged that expert advice may provide valuable guidance for a multi-modal approach to aesthetic treatment.\(^{55}\)

Parts of the available guidelines are focused on specific subpopulations, according to patients’ ethnic origin, gender, or age.\(^{6,18,19,53,54,56}\) as the achievement of optimal outcomes results from a patient-centred treatment plan.

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**Figure 4** Algorithm for neck rejuvenation.

**Note:** Possible touch up with a HA filler indicated for neck rejuvenation 2 weeks after PLLA/PLGA sutures.

**Abbreviations:** BoNT, botulinum neurotoxin; EBD, energy-based device; HA, hyaluronic acid; PLLA/PLGA, poly-L-lactic acid/poly-glycolic acid.
Indeed, facial morphology and age-related changes differ across ethnic groups, which result in distinct treatment goals and priorities or components of combination treatments. However, the loss of volume occurs in all ethnicities, explaining the reason for volumisation always being a crucial step in rejuvenation treatment. The qualitative and quantitative differences in treatment are limited for early intervention/enhancement and restoration, most combination strategies being similar or slightly different in Asian and Caucasian patients. In addition, our board-convened members from diverse geographic areas and cultural background ideals, and the proposed protocols account for the main variations of ethnic aesthetic problems and ideals. However, our guidelines always need adaptation to specific contexts and individual needs.

### Conclusion

These new practice guidelines will probably prove helpful for practitioners by advising the optimal management strategy in the multimodal rejuvenation treatment of different face areas when combining the PCL collagen stimulator, the PLLA/PLGA suspension sutures, and the cross-linked HA, whether associated or not with other frequently used MIPs. Individual treatment plans should

<table>
<thead>
<tr>
<th>First Author, Year</th>
<th>Target Areas</th>
<th>Combination Treatment Components</th>
<th>Target Population, Consensus Method, Specific Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chao 2017</td>
<td>Upper, mid-, and lower face</td>
<td>BoNTx, CaHA, HA, MFU-V</td>
<td>Asian patients Formal consensus-based guidelines Demand for beautification more common than in Caucasian</td>
</tr>
<tr>
<td>Kapoor 2017</td>
<td>Upper, mid-, and lower face Neck</td>
<td>BoNTx, HA</td>
<td>Indian patients Formal consensus-based guidelines Facial anthropometry, morphology, and age-related changes in Indians are specific</td>
</tr>
<tr>
<td>Carruthers 2016</td>
<td>Upper, mid-, and lower face Neck</td>
<td>BoNTx, CaHA, HA, MFU-V</td>
<td>All Fitzpatrick skin types Formal consensus-based guidelines Recommended spacing consecutive treatments on same area 1–2 weeks apart, if possible MFU-V recommended before injectable agents</td>
</tr>
<tr>
<td>Fabi 2016</td>
<td>Upper, mid-, and lower face Neck</td>
<td>BoNTx, HA MFUS, RF</td>
<td>Diverse populations, worldwide perspective Formal consensus-based guidelines Recommended re-evaluation of patients 2–4 weeks after either treatment Summary statements for specific groups (age, gender, ethnicity)</td>
</tr>
<tr>
<td>Sundaram 2016</td>
<td>Upper, mid-, and lower face Neck</td>
<td>BoNTx, HA MFUS, RF</td>
<td>Diverse populations, worldwide perspective Formal consensus-based guidelines Recommended re-evaluation of patients 2–4 weeks after either treatment Summary statements for specific groups (age, gender, ethnicity)</td>
</tr>
<tr>
<td>Werschler 2015</td>
<td>Face</td>
<td>MFUS, RF ± HA</td>
<td>Caucasians Informal consensus Discussion on decision approach (initial assessment; patient expectations; treatment selection) and various fillers (CaHA, HA, PLLA)</td>
</tr>
<tr>
<td>Carruthers 2008</td>
<td>Upper, mid-, and lower face</td>
<td>BoNTx, HA</td>
<td>Diverse populations Informal consensus Discussion on the influence of patient sex, ethnicity, cultural ideals, and skin colour; general techniques; patient education and counselling</td>
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<tr>
<td>Wu 2016</td>
<td>Upper, mid-, and lower face, neck</td>
<td>BoNTx, HA ±IPL</td>
<td>Asian patients Informal consensus Treatment selection according to age</td>
</tr>
</tbody>
</table>

**Abbreviations:** BoNTx, botulinum neurotoxin; CaHA, calcium hydroxyapatite; HA, hyaluronic acid; IPL, intense pulsed light; MFUS, micro-focused ultrasound; MFU-V, micro-focused ultrasound with visualization; PLLA, poly-L-lactic acid; RF, radiofrequency; wks, weeks.

that accounts for facial morphotype as well as personal and cultural aesthetic ideals. Indeed, facial morphology and age-related changes differ across ethnic groups, which result in distinct treatment goals and priorities or components of combination treatments. However, the loss of volume occurs in all ethnicities, explaining the reason for volumisation always being a crucial step in rejuvenation treatment. The qualitative and quantitative differences in treatment are limited for early intervention/enhancement and restoration, most combination strategies being similar or slightly different in Asian and Caucasian patients. In addition, our board-convened members from diverse geographic areas and cultural background ideals, and the proposed protocols account for the main variations of ethnic aesthetic problems and ideals. However, our guidelines always need adaptation to specific contexts and individual needs.
always be adapted according to the physician’s individual competence and the patient’s preferences and needs.

**Disclosure**

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**References**


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