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The Assessment, Strategy, and Treatment Protocol: Nasolabial Fold Assessment, Strategy, and Treatment With Hyaluronic Acid Fillers in Chinese Patients

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Background: Causes contributing to nasolabial fold (NLF) appearance can be multifactorial, hence requiring distinct dermal filler strategies. We devised 4 assessment, strategy, and treatment (AST) injection protocols, incorporating NLF etiology and severity, patient expectations, and the selection of Belotero Balance Lidocaine (BBL) and Belotero Volume Lidocaine (BVL) hyaluronic acid fillers.
Methods: The underlying etiology and photonumeric assessments of NLF severity guided protocol selection. In protocol 1, the NLF was injected directly with BBL into the mid-to-deep dermis and/or immediate subdermal plane. In protocol 2, BVL was injected using dual-plane sandwich technique into the canine fossa and subcutaneous layers. Protocol 3 combined indirect injections of BVL into the deep medial cheek fat compartment and preauricular hollows to lift ptotic soft tissue, followed by direct NLF injections with protocols 1 and 2. In protocol 4, BVL was injected into the temple and/or jawline, in combination with midface augmentation (AST protocol 3) and direct NLF injections (AST protocols 1 and 2) to fully address all underlying etiologies contributing to NLF appearance.
Results: AST protocols facilitate treatment customization to each patient's NLF etiology and severity through direct and indirect approaches. At 30 days, NLF severity improved visibly and satisfactorily. Improvements varied from effacement of superficial nasolabial wrinkles to shallower NLF depth, improvement in cheek projection and nasojugal groove appearance, and smoother submalar contours.
Conclusions: The AST protocols provide a strategic reference for combining BBL and BVL in a personalized patient-centric approach for effective, holistic, and balanced NLF corrections and pan-facial aesthetic improvements. *(Plast Reconstr Surg Glob Open 2025;13:e6792; doi: 10.1097/GOX.0000000000006792; Published online 27 May 2025.)*

INTRODUCTION

Nasolabial folds (NLFs) are early manifestations of facial aging, deepening progressively with age and muscular activities such as smiling.[1] NLFs contain less subcutaneous fat medially and more laterally, the latter linked with NLF development during aging[2] and muscle movements.[3] Aging worsens NLF prominence through midface and lower face bone resorption, diminished maxillary projection,[4,5] zygomatic ligament laxity, malar fat pad ptosis and inferior descent, and nasolabial fat reorientation downward.[6–8]

Five NLF types were recently reclassified based on underlying etiology[5]—fat pad, skin, bone retrusion, muscular, and hybrid types,[1] with anatomical distinctions necessitating different approaches, for example, hybrid-type NLFs need deep medial cheek fat compartment revolumization and facial ligament support restoration in addition to direct filling of NLF.[5] NLF-associated

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volume deficits are effectively[5,9–12] and safely[13–15] treated nonsurgically[16] using hyaluronic acid (HA)-based fillers. NLF treatments involve direct injection,[17] and indirect approaches comprising revolumization of deep cheek fat compartments,[17] and restoration of bony structural support.[18] However, conventional filling protocols can cause unsatisfactory results[1] with wide midfaces and prominent cheekbones in Asians,[5] who prefer subtler cheekbone projections, smoother facial contours, and slimmer midfaces. With variable NLF classifications, protocols, and preferences, Asian patients require anatomically appropriate filler-based NLF strategies.[1,5,19–21]

Belotero (BEL; Anteis S.A., Geneva, Switzerland) fillers[22] have varying HA concentration (20–26 mg/mL) and cross-linking ratios for different applications, including soft-tissue volume augmentation and skin rejuvenation. BEL is manufactured through dynamic cross-linking technology with 1,4-butanediol diglycidyl ether, generating a cohesive polydensified matrix (CPM) HA gel comprising areas of higher and lower densities[23,24] that facilitates homogenous spread and optimal tissue integration.[22,25–29] Belotero Balance Lidocaine[12,30] (BBL; HA concentration 22.5 mg/mL) is approved by China's National Medical Products Administration as a biodegradable implant for direct mid-dermis injections to fill moderate NLFs, whereas Belotero Volume Lidocaine[31,32] (BVL; HA concentration 26 mg/mL) is approved for deep-dermis or subcutaneous injections to fill severe NLFs.

Although these products were approved for use individually, real-world NLF treatment depends on several factors including severity and etiology, which might require fillers used in combination via direct and indirect approaches. A split-face study of Chinese patients with moderate NLFs[12] found BBL to be noninferior to Restylane, improving 6-month Wrinkle Severity Rating Scale scores by 62.9% versus 64.9%, with significantly less pain. BVL effectively and safely corrected severe NLFs (Wrinkle Severity Rating Scale grade 4), was noninferior to Restylane at 6 and 12 months,[32] with sustained improvements up to 18 months. Another split-face study[33] comparing BVL with other volumizing HA fillers (Juvéderm Voluma, Restylane SubQ, or Yvoire Contour) found the greatest change in tissue heights and longest volume maintenance with BVL, with good injectability and spread suiting high-pressure regions (eg, NLF). Areas treated with BVL continued to show volumetric changes even at 2 years, suggesting that treatment effects were long-lasting.[34] To holistically address different types of NLFs in Chinese individuals, we devised comprehensive injection protocols with BBL and BVL incorporating NLF anatomy, etiology, Merz Aesthetics Scales (MAS)[35] severity, patient expectations, and product selection, and demonstrate visible improvements through a case series.

Takeaways

Question: Can nasolabial folds (NLFs) in Asian patients be more effectively treated with hyaluronic acid dermal fillers?

Findings: The assessment, strategy, and treatment (AST) injection protocols incorporated NLF anatomy and etiology, patient expectations, and product selection to yield consistent, visible, and satisfactory improvements in NLF severity at 30 days, while allowing individualization to optimize outcomes and improve patient satisfaction.

Meaning: Conventional filling protocols may produce unsatisfactory NLF improvements or a wide midface and prominent cheekbones. The strategy-driven AST protocols produced holistic results while targeting all key contributors of NLFs.

METHODS

Assessment, Strategy, and Treatment Protocols 1–4

To customize treatment strategies (injection points, plane, and dose), we developed 4 protocols based on assessments of NLF severity, patient-specific anatomy, and underlying etiology responsible for NLF appearance.[1]

Assessment

NLF etiology must be distinguished from NLF severity (MAS grade), as etiology determines the treatment protocol, whereas NLF severity affects dose. Although more severe NLFs tend to result from a greater number of underlying etiologies, both factors should be assessed separately to guide treatment strategy. Four levels of NLF severity (mild to very severe) can be established from the photonumeric MAS. (**See figure, Supplemental Digital Content 1**, which displays MAS for NLF at rest, **https://links.lww.com/PRSGO/E51**.) In terms of etiology, NLFs can be classified into the following types: skin, fat pad, bone retrusion, and mixed.[1] Skin-type NLFs develop from collagen fiber breakage and HA loss in dermal tissues. Fat pad–type NLFs[1] display nasolabial fat pad hypertrophy and ptosis, with NLF concavity deepening upon smiling. Bone retrusion–type NLFs result from the loss of bony support in the pyriform aperture, producing a more concave upper NLF. Hybrid NLFs combine at least 2 aforementioned NLF types. We observed that level 1 NLFs are caused by deterioration of the dermal layer.[1] Level 2–4 NLFs arose from etiologies affecting the dermis, subcutaneous layers, fat pads, and bone (ie, hybrid NLF), starting with dermal thickness and subcutaneous fat loss, and pyriform foramen bone retrusion in level 2 NLFs. These progress in level 4 NLFs to severe skin laxity and volume loss in the temples, lateral and medial cheeks, mandibles, and nasolabial areas. Although NLF severity and etiology inform the selection of assessment, strategy, and treatment (AST) protocols and injection strategies, we emphasize that the various AST protocols are not meant to correspond specifically to the 4 consecutive MAS levels for NLF. To demonstrate the different protocols clearly, case examples of progressive NLF grades (1–4) are presented.

Strategy and Treatment

AST Protocol 1. This protocol addresses superficial skin-type nasolabial wrinkles due to loss of collagen, HA, and

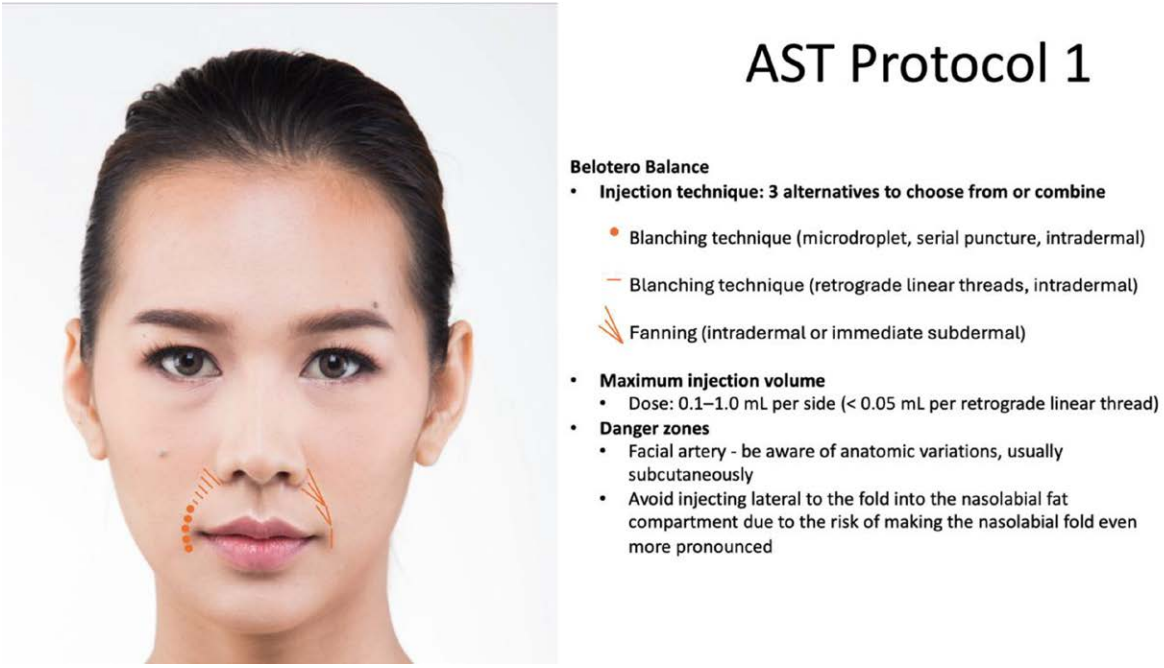


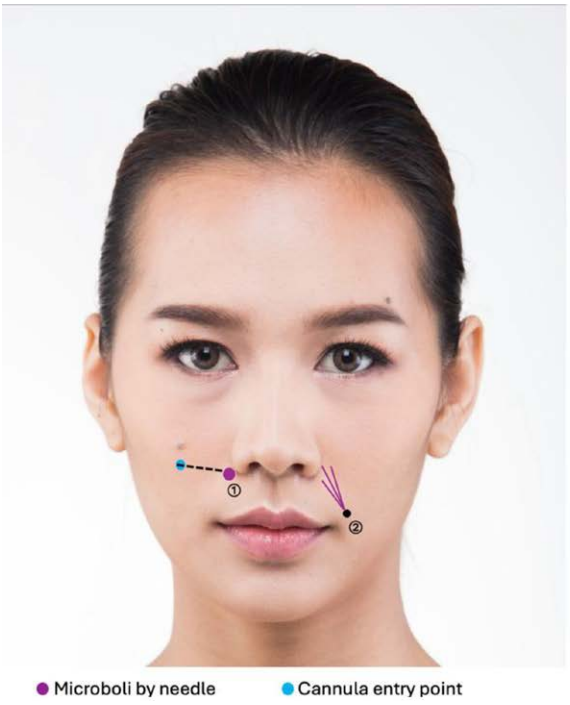
Fig. 1. AST protocol 1.

subcutaneous fat (Fig. 1). As NLF skin experiences long-term dynamic muscle activity and traction, BBL was selected for its high tissue integration, high cohesivity, and relatively low viscosity.[24] Depending on the NLF length and depth, BBL can be injected directly into the mid- and deep dermis using the blanching technique (0.1–0.5 mL/side intradermally into the mid- and deep dermis by blanching, for a total of 0.1–1 mL/side), or into the immediate subdermal plane using retrograde fanning (<0.05 mL per retrograde linear thread).[36,37] The blanching technique is recommended, but the physician's experience, technical skill, and comfort level should determine the choice of injection tool and technique.

AST Protocol 2. Direct injection with a dual-plane sandwich technique[24,38] is recommended when NLF appearance is exacerbated by insufficient deep bony support due to maxillary retrusion (congenital or age-related) and soft-tissue volume loss (Fig. 2). BVL offers deep tissue support and projection due to its high E', normal force (F_N), and moderate G' that resists compression.[39] BVL (0.1–0.5 mL/side; Fig. 2, point ①) can be injected supraperiosteally with a sharp needle or cannula (25G or larger) into the canine fossa/Ristow space. If a needle is used, avoid large boluses (>0.1 mL) and build up the intended dose gradually with microboluses (<0.05 mL) administered through small-amplitude movements of the needle without exiting the skin.[40] Lateral entry points are preferred for cannulas, with injection directions perpendicular to the facial artery to reduce vascular occlusion risks. Subsequently, BVL is delivered subcutaneously (0.2–1.0 mL; Fig. 2, point ②) using a cannula in retrograde linear threads of less than 0.05 mL. Subcutaneous plane injections can be performed with BBL instead of BVL in thinner-skinned patients (AST protocol 1).

AST Protocol 3. When midface deflation contributes to NLF appearance, restoring volume in the deep cheek fat compartments and correcting maxillary and zygomatic bone resorption are essential (Fig. 3). An indirect approach to elevate ptotic soft tissues should be combined with direct injections into the NLF (AST protocols 1 and 2). BVL (0.2–0.5 mL/side) was injected sequentially as microboluses (<0.05 mL) into the supraperiosteal plane and deep medial cheek fat compartment using a needle (Fig. 3, point ①) or cannula (Fig. 3, point ②). The infraorbital foramen was palpated and marked, and the infraorbital artery was carefully avoided. Patients with preauricular hollowing received BVL (0.3–1.0 mL/side) subcutaneously via cannula (Fig. 3, point ③) to smooth the submalar-to-zygomatic arch transition and provide an indirect lifting effect on the NLF. This indirect approach targets the midface and submalar areas, followed by direct correction with AST protocols 1 and 2.

AST Protocol 4. Advanced facial aging, retaining ligament laxity,[41] temple volume loss, and mandibular bone resorption[1] may exacerbate NLF appearance, necessitating augmentation of the temples and mandibular angle (Fig. 4). In a skeletonized-looking face with severe anterior temple volume loss, BVL was injected supraperiosteally (0.1–1.0 mL/side) with a needle in microboluses (<0.05 mL) (Fig. 4, point ①). Posterior temple volume loss was corrected with subcutaneous (0.1–0.3 mL/side) or inter-fascial plane (0.4–1.0 mL/side) cannula injections (Fig. 4, point ②). Two vascular structures to avoid during temple injections are (1) the superficial temporal artery within the superficial temporal fascia, which connects to the supraorbital artery, a branch of the ophthalmic artery; and (2) the anterior deep temporal artery, running in the temporalis muscle and anastomosing with the



AST Protocol 2

Belotero volume injection technique, site, dose, layer and volumes

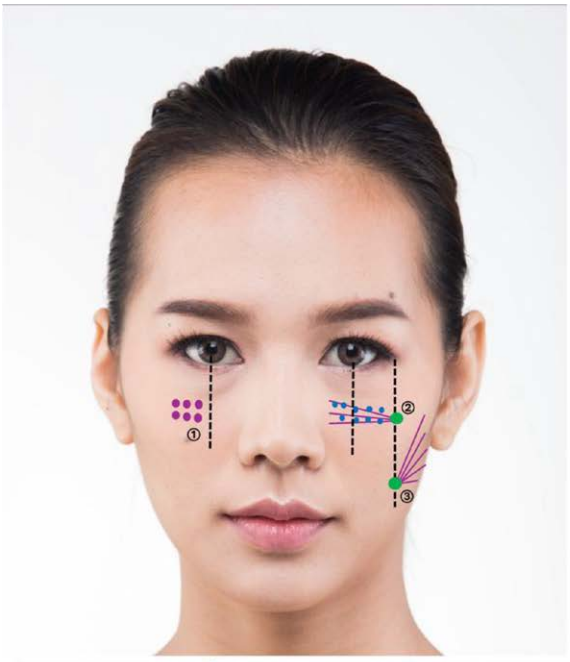
① **Bolus**: needle or cannula (25G or larger)
- a. **Injection site**: canine fossa/Ristow's space
- b. **Dosage**: BVL 0.1–0.5 mL/side (microboli of < 0.05 mL)
- c. **Layer**: Supraperiosteal
  - * Lateral entry point with cannula is preferred due to perpendicular direction to facial artery

② **Fanning**: Retrograde linear threading by cannula (25G or larger)
- a. **Dosage**: BVL or BBL 0.2–1.0 mL/side (product choice depending on skin thickness)
  - < 0.05 mL per retrograde linear thread
- b. **Layer**: subcutaneous/immediate subdermal

- **Danger zones**
  - Facial artery - be aware of anatomic variations, usually subcutaneously
  - Avoid injecting lateral to the fold into the nasolabial fat compartment due to the risk of making the nasolabial fold even more pronounced

***Note**: Combine with AST Protocol 1 for optimal correction of NLF. Injection points not shown for clarity due to an overlap of markings in the same area—refer to Figure 1.*

Fig. 2. AST protocol 2.



AST Protocol 3

Belotero volume injection technique, site, dose, layer and volumes

① **Bolus**: needle
- a. **Injection site**: 0.5–1.0 cm lateral to mid-pupillary line
- b. **Dosage**: BVL 0.2–0.5 mL/side
  - Microbolus of < 0.05 mL
- c. **Layer**: supraperiosteal

② Fanning: Bolus or linear threading by cannula (25G or larger)
- a. **Entry point**: perpendicular line from the lateral canthus at lower border of zygoma
- b. **Dosage**: BVL 0.2–0.5 mL/side
  - Microbolus of < 0.05 mL
- c. **Layer**: supraperiosteal

③ Fanning: linear threading by cannula (25G or larger)
- a. **Entry point**: along the line perpendicular to the lateral canthus
- b. **Dosage**: BVL 0.3–1.0 mL/side
- c. **Layer**: subcutaneous

- **Danger zones**
  - Facial artery (be aware of anatomical variation, usually subcutaneous)
  - Infraorbital artery (foramen can be palpated and marked)

***Note**: Combine with AST Protocols 1 and 2 for optimal correction of NLF. Injection points not shown for clarity due to an overlap of markings in the same area—refer to Figures 1 & 2.*

Fig. 3. AST protocol 3.

zygomaticotemporal artery, which joins the ophthalmic artery in the deep temporal fat pad.[42] For jawline augmentation, BVL (0.3–1.0 mL/side) was placed subcutaneously along the mandible ramus and body through a mandibular angle entry point (Fig. 4, point ③). Patients with mandibular angle blunting and anteromedial movement may benefit from needle injection of BVL (0.2–0.5 mL/side) supraperiosteally to restore age-related bone loss and superficial musculoaponeurotic system (SMAS) tension. These steps should be combined with midface augmentation (AST protocol 3) and direct NLF injections (AST protocols 1 and 2) to fully address the underlying NLF

AST Protocol 4

Belotero volume injection technique, site, dose, layer and volumes

① **Bolus**: needle
- a. **Injection site**: Anterior temple (a zone within 1 cm superior to tail of brow and 1 cm lateral to temporal fusion line)
- b. **Dosage**: BVL 0.1—1.0 mL/side
  - Microbolus of < 0.05 mL
- c. **Layer**: supraperiosteal

② **Fanning**: retrograde linear threading by cannula (25G or larger)
- a. **Entry point**: middle of the zygomatic arch
- b. **Dosage**: BVL 0.4—1.0mL/side for interfascial or 0.1—0.3 mL/side for subcutaneous layer
  - < 0.05 mL per retrograde linear thread
- c. **Layer**: subcutaneous and/or interfascial

③ **Fanning**: retrograde linear threading by cannula (25G or larger)
- a. **Entry point**: Mandibular angle
- b. **Dosage**: BVL 0.3—1.0 mL/side
  - < 0.1 mL per retrograde linear thread
- c. **Layer**: subcutaneous

Optional: Bolus injection with needle supraperiosteally on the mandibular angle to provide tissue support (0.2—0.5 mL/side)

- **Danger zones**
  - Superficial temporal artery (located within the superficial temporal fascia)
  - Anterior deep temporal artery (runs in the temporalis muscle)

***Note**: Combine with AST Protocols 1—3 for optimal correction of NLF. Injection points not shown for clarity due to an overlap of markings in the same area—refer to Figures 1—3.*

Fig. 4. AST protocol 4.

etiologies. Combination with other modalities (eg, energy-based devices and biostimulators) can improve skin quality for holistic outcomes.

Filler complication risks in the highly vascularized nasolabial region can be mitigated[42] by avoiding needles during subcutaneous injections. Injecting intradermally with the blanching technique lowers the risk of intravascular complication as the dermis lacks major blood vessels. However, BBL should be carefully delivered in microdroplets to prevent persistent visible, palpable papules. Importantly, injection volumes should be kept low to avoid intravascular complications, including embolisms leading to blindness.[43] Risks can be further reduced by a comprehensive understanding of facial anatomy, injecting slowly, limiting bolus volumes to 0.1 mL, vasoconstricting with adrenalized anesthetics, choosing blunt cannulas over sharp needles, and introducing cannulas perpendicularly to arteries.[40] If using a needle, preinjection aspiration may prevent accidental intravascular injections, provided the needle is primed, aspiration is performed for sufficiently long, and a suitable product/needle combination is selected.[44] Injectors must be mindful of possible false-negative aspiration tests and not be lured into a false sense of security. Instead, injectors should consider delivering microboluses with consistent, fine-amplitude movements when using a needle.[40]

The AST protocols are summarized in Supplemental Digital Content 2. (**See figure, Supplemental Digital Content 2**, which displays the AST protocol workflow, **https://links.lww.com/PRSGO/E52**.)

RESULTS

Patients were digitally photographed (A7R5, SONY Co., Ltd., Beijing, China) preinjection (baseline), immediately posttreatment, and at 30 days postinjection (follow-up). (**See figure, Supplemental Digital Content 3**, which displays AST protocols 1–4 patient results. Patients are shown before, immediately posttreatment, and 1 month posttreatment, **https://links.lww.com/PRSGO/E53**.)

AST Protocol 1. A 26-year-old female patient with MAS grade 1 NLF received BBL intradermally (0.6 mL) and subcutaneously (1.9 mL) into the NLFs (Fig. 5). At follow-up, the NLF had improved with effacement of the superficial nasolabial wrinkles.

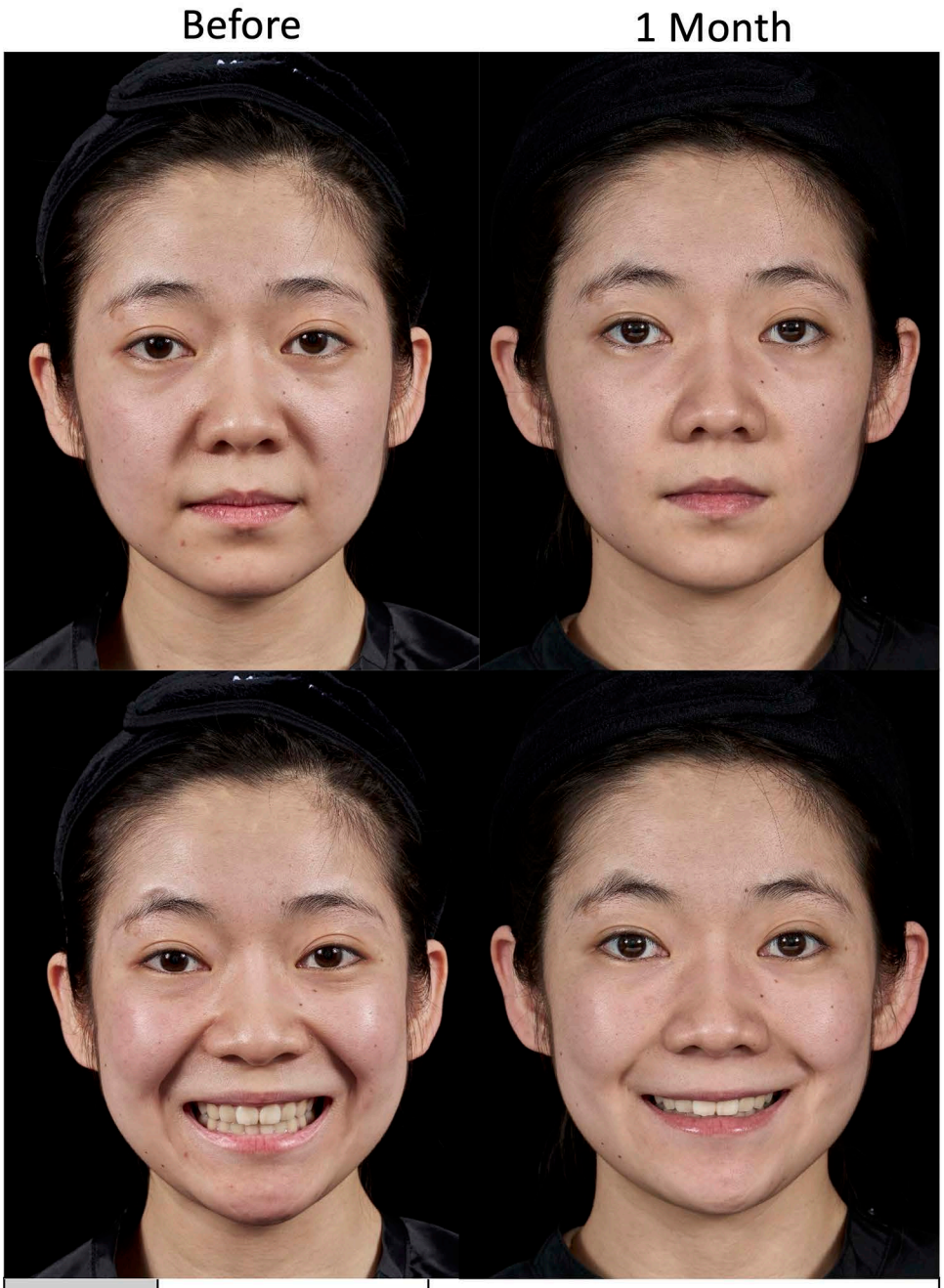
AST Protocol 2. A 23-year-old female patient with grade 2 NLF due to retruded maxilla received BVL supraperiosteally in the canine fossa (1.0 mL) and subcutaneously along the NLF (0.8 mL), followed by intradermal BBL (1.0 mL) to smoothen superficial fine wrinkles (Fig. 6). At follow-up, the NLF depth had improved markedly, especially in the upper half with pyriform aperture projection.

AST Protocol 3. A 33-year-old female patient with grade 3 NLF secondary to midface volume loss and descent of superficial fat compartments received BVL supraperiosteally (1.0 mL) in the anteromedial cheek and subcutaneously in the preauricular region (1.4 mL), followed by direct subcutaneous (0.5 mL) and intradermal (0.5 mL) injections of BBL in the NLF (Fig. 7). At follow-up, the anterior cheek projection and nasojugal groove had improved visibly, submalar transitions and contours were smoother, and NLF severity had improved significantly.

AST Protocol 4. A 43-year-old female patient had grade 4 NLF from age-related bone resorption of the maxilla and zygoma, atrophy of the deep fat compartments in the

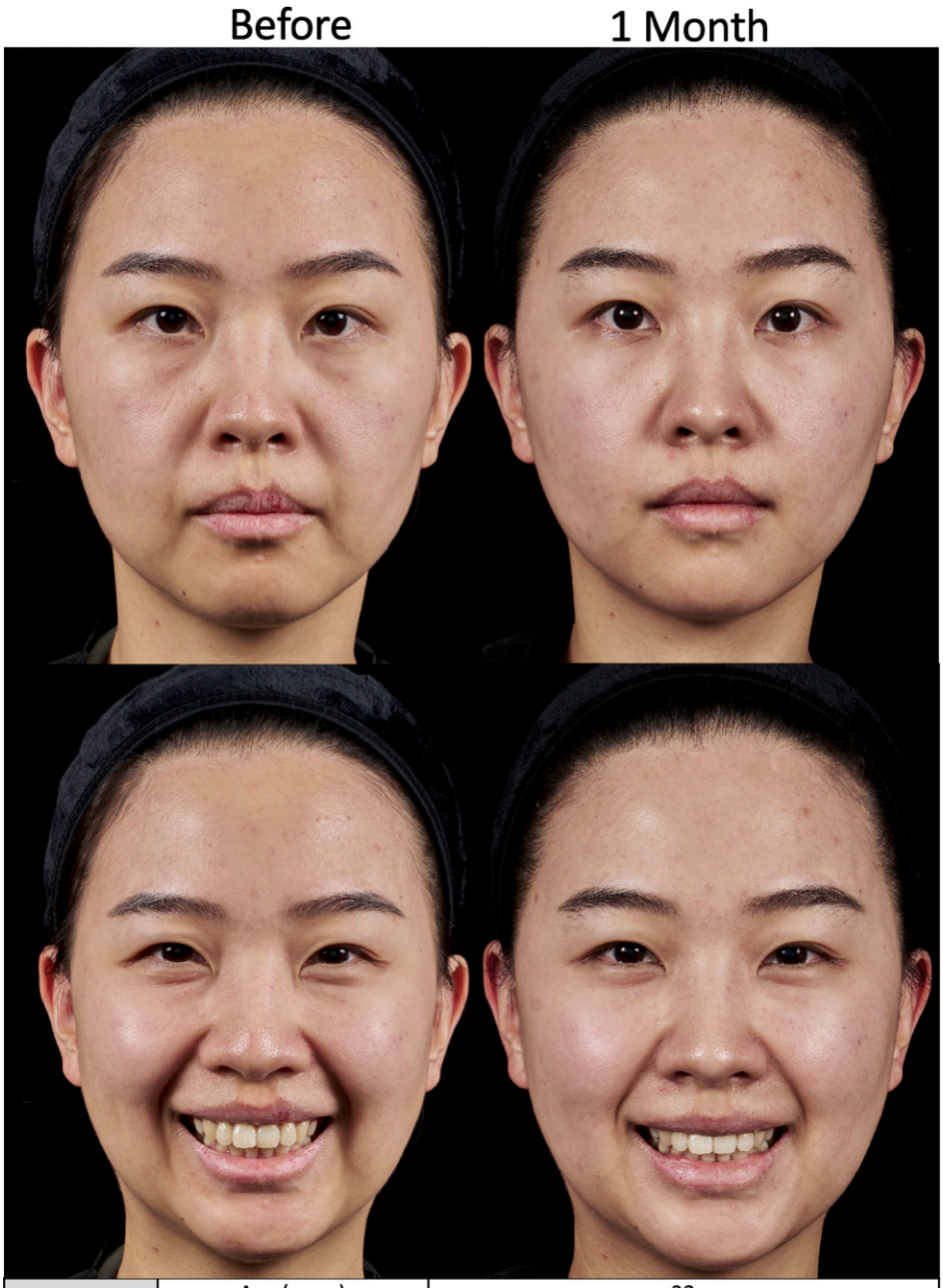
Assessment	Age (years)	26
	MAS grade for NLFs	1
	NLF etiology	Signs of aging due to loss of dermal collagen fibers and HA, and subcutaneous fat loss in the NLF
Strategy	AST protocol selection	Protocol 1
Treatment	NLF – Intradermal BB, 0.6 mL for both sides NLF – Subcutaneous BB, 1.9 mL for both sides	

Fig. 5. AST protocol 1 patient results. Patient shown before treatment and 1 month posttreatment with BBL 2.5 mL. BB, Belotero Balance. Courtesy of Dr. Kai-Chin Hung.



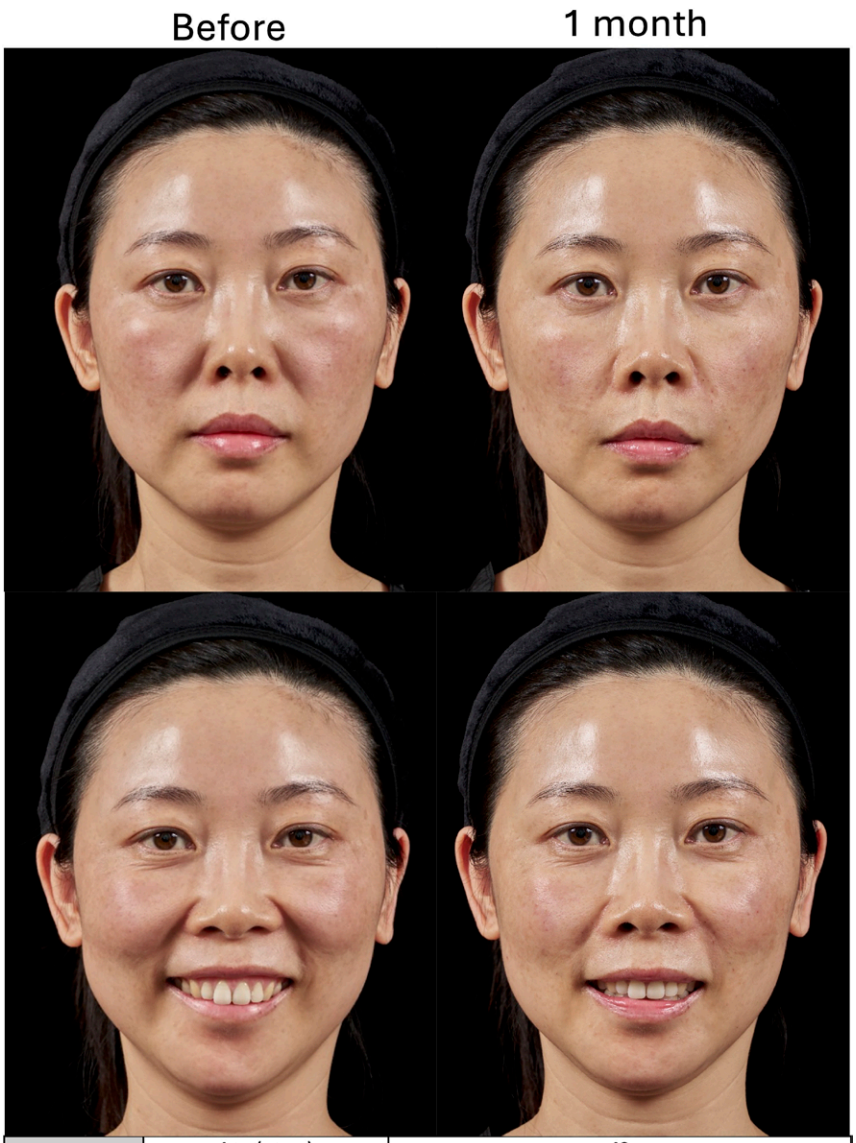
Assessment	Age (years)	23
	MAS grade for NLFs	2
	NLF etiology	Loss of dermal thickness and subcutaneous fat, and maxilla retrusion
Strategy	AST protocol selection	Protocol 2
Treatment	NLF – Intradermal BB, 1 mL for both sides NLF – Subcutaneous BV, 0.8 mL for both sides NLF – Supraperiosteal BV, 1 mL for both sides	

Fig. 6. AST protocol 2 patient results. Patient shown before treatment and 1 month posttreatment with BBL 1.0 mL and BVL 1.8 mL. BB, Belotero Balance; BV, Belotero Volume. Courtesy of Dr. Qin Li.



Assessment	Age (years)	33
	MAS grade for NLFs	3
	NLF etiology	Sagging cheek muscles and downwards shift of superficial fat
Strategy	AST protocol selection	Protocol 3
Treatments	Midface – Anterior cheek (supraperiosteal) BV, 1 mL for both sides Midface – Auricularis anterior area (subcutaneous) BV, 1.4 mL for both sides NLF – Intradermal BB, 0.5 mL for both sides NLF – Subcutaneous BB, 0.5 mL for both sides	

Fig. 7. AST protocol 3 patient results. Patient shown before treatment and 1 month posttreatment with BBL 1.0 mL and BVL 2.4 mL. BB, Belotero Balance; BV, Belotero Volume. Courtesy of Dr. Lijun Zhou.



Assessment	Age (years)	43
	MAS grade for NLFs	4
	NLF etiology	Aging factors present include volume loss in temples, anterior and lateral cheeks, and bone retrusion in pyriform sinus
Strategy	AST protocol selection	Protocol 4
Treatments	Temple – Subcutaneous BV, 1 mL for both sides Temple – Supraperiosteal BV, 2 mL for both sides Midface – Anterior cheek (supraperiosteal) BV, 1 mL for both sides Midface – Lateral cheek/submalar region (subcutaneous) BV, 1.9 mL for both sides; and auricularis anterior area (subcutaneous) BV, 1.6 mL for both sides NLF – Intradermal BB, 0.7 mL for both sides NLF – Subcutaneous BV, 1.4 mL for both sides NLF – Supraperiosteal BV, 1.3 for both sides	

Fig. 8. AST protocol 4 patient results. Patient shown before treatment and 1 month post-treatment with BBL 2.6 mL and BVL 8.3 mL. BB, Belotero Balance; BV, Belotero Volume. Courtesy of Dr. Qingyang Liu.

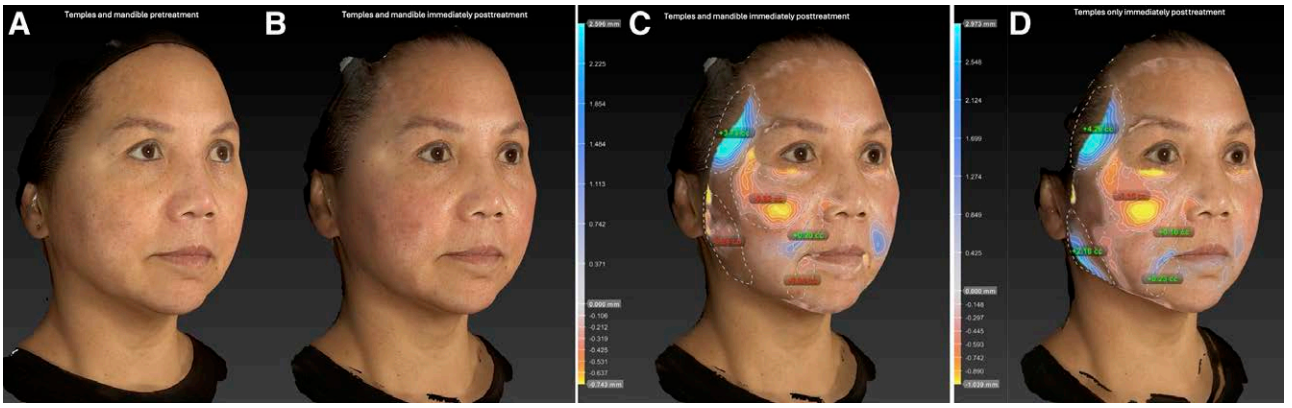


Fig. 9. Three-dimensional imaging of a patient. The patient is shown immediately before (A) and after (B) BV injections into both the temples and the mandible, resulting in a 0.10 cm^3 increase in volume in the NLF region (C). Interestingly, immediately after BV injections only into the temples (D), the NLF volume increased by 0.20 cm^3 (D). Strategic placement of BV in lateral facial regions distant to the NLF can thus lead to a discernible enhancement in NLF volume. Volume changes were measured using 3-dimensional Canfield Vectra. Courtesy of Dr. Jani van Loghem.

midface and temples, and loss of skin elasticity. BVL was injected supraperiosteally (2.0 mL) and subcutaneously (1.0 mL) in the temples, supraperiosteally in the anterior cheek (1.0 mL), and subcutaneously in the lateral cheek/preauricular area (3.5 mL) (Fig. 8). BVL was directly injected into the NLFs, supraperiosteally (1.3 mL) in the canine fossa and subcutaneously (1.4 mL), whereas BBL was injected intradermally (0.7 mL) along the NLF. At follow-up, the patient had a more oval-shaped face with smoother temple and submalar contours, restored midface and infraorbital area support, lifting of lower face soft tissue, a slimmer face despite receiving 10.9 mL of fillers, and markedly improved NLFs at rest and during animation.

DISCUSSION

We formulated a rational and systematic framework comprising 4 protocols for NLFs of different etiologies with BEL HA fillers currently approved in China—Belotero Balance and Belotero Volume—and demonstrated efficacy in NLF correction through a case series. Even with different injectors, AST protocols provided consistent, visible, and satisfactory improvements in NLF severity as early as 30 days posttreatment.

The NLF represents an early sign of aging[45] and is anatomically complex due to its mobility.[5] Its correction is complicated by multiple facial aging effects, for example, bone retrusion, soft tissue ptosis, and deep medial cheek fat or subcutaneous NLF volume loss.[46] Gravitational pull on excessive nasolabial and superficial medial cheek subcutaneous fat can deepen NLFs and may require invasive liposuction. Meanwhile, innovations in dermal filler injection techniques, technologies, and strategies have increased minimally invasive filler-based NLF correction.[9,47–50] In Chinese patients, injecting fillers for zygomatic and zygomaticocutaneous ligament support indirectly resolves midface sagging and minimizes NLFs as a secondary effect.[5] Injecting HA fillers between the deep medial cheek fat and periosteum, or supraperiosteally into the canine fossa[5] addresses bone retrusion NLFs, whereas augmentation of deep medial cheek fat compartments creates cheek prominence and naturally improves NLF appearance.[51] Following the correction of midface volume loss and bony retrusion, direct filler injection along the NLF helps to treat subcutaneous volume loss.

Our AST protocols present a comprehensive diagnostic and therapeutic approach, beginning with assessments of NLF severity and etiology, and integrating patient expectations and desired aesthetic improvements to tailor a holistic treatment plan with BVL and BBL. Etiology includes congenital anatomical factors, such as zygomatic and maxillary bone deficiencies, or age-related factors such as skin laxity, bone resorption, and soft-tissue volume loss. BVL has been shown to indirectly improve NLF appearance following injection into the midface.[52] Interestingly, posterior temporal supra-SMAS filler injections also provided a lifting effect to indirectly decrease age-associated changes in the midface and lower face, including the NLF.[53] To achieve this extended effect, fillers were placed superficial to the superficial temporal fascia, which is continuous with the SMAS. The superficial temporal fat compartments are enclosed and supported by fibrous septa walls on the superficial temporal fascia and are present within the temporal subdermal layer.[54] When septa are intact and compartmental volumes are increased (eg, by fillers), the fat compartments move anteriorly or superiorly (upward).[53] Consequently, skin adjacent to these areas or in the lower face also moves upward. As demonstrated with 3-dimensional Canfield Vectra imaging, strategic placement of BVL in lateral facial regions distant from the NLF, such as the temple and mandible regions, can indirectly augment the NLF and produce a visible improvement in NLF appearance (Fig. 9). Similar observations have been postulated or demonstrated by others. This effect may potentially result from the interconnections between different facial areas, such that treatment of one area produces effects elsewhere.[55–57] For example, 1 patient experienced global improvements

and immediate lifting of the whole face and less malar and nasolabial fat ptosis, simply from supra-auricular fillers.[58] Further studies are needed to confirm these distal effects with AST protocols, for example, through sequential or isolated individual injections. After establishing NLF severity and etiology, treatment decisions are made on whether to inject directly into the NLF or to combine with indirect approaches involving the midface, temples, and jawline. Products can also be used independently or in combination with other modalities. For example, microfocused ultrasound with visualization stimulates new collagen and elastin production[59–62] in the SMAS and dermal layers to lift ptotic soft tissues[63,64] and potentially improve NLF appearance.

Clinical evidence has shown sustainable aesthetic outcomes, good safety profiles, and long-term tolerability of BEL fillers. Our protocols use BVL and BBL—CPM HA fillers that provide optimal tissue integration[27] for smooth results, minimal risk of Tyndall effects, and a low risk of delayed inflammatory reactions.[65,66] In contrast, HA-based fillers manufactured by Vycross technology, such as Juvéderm Volbella, may be more immunogenic and have a higher risk of delayed-onset nodule formation than other HA-based gels.[67,68] A retrospective chart review of 400 patients injected with Juvéderm Volbella into the lips and tear troughs reported that 4.25% experienced prolonged and recurrent delayed inflammatory reactions, which is significantly higher than the accepted safety threshold of 0.02% for HA-based fillers.[67] Furthermore, 1 comparative histology study[69] demonstrated that Juvéderm Voluma had a more pronounced inflammatory reaction with macrophages and giant cells around the implant on day 21, but no signs of an inflammatory reaction around the BVL implant. BVL can safely restore facial volume in dynamic sites (eg, cheek/midface) and can be easily layered on the periosteum and in subcutaneous layers. BVL's high projection capacity (E' and F_N) is suited to augmentation of the chin, cheek, and temples, whereas its high plasticity optimizes moldability for smooth transitions while allowing natural facial expressions.[70] BBL is designed for superficial injection into intradermal and subdermal layers to smoothen fine lines and volumize the perioral and periorbital areas (tear troughs). As we have shown, BBL was effectively combined with BVL to treat different NLF etiologies and achieve consistent and satisfactory clinical outcomes. Our study was limited by its small sample size, lack of control, and short follow-up. As it was an initial, exploratory concept of the AST protocols, most outcomes were restricted to subjective assessments, and we did not objectively measure the individual effect of each injection area on NLF depth. Longer term, large-cohort studies are needed within this patient population to confirm the statistical validity of our results, supplemented with objective topographic and/or 3-dimensional imaging with volumetric measurements.

CONCLUSIONS

The AST protocols comprise an assessment of facial indications based on anatomy, etiology, and NLF severity, to develop an injection strategy utilizing BBL and BVL through direct and indirect approaches. The chosen treatment encompassed various injection techniques to customize outcomes for natural and lasting aesthetic rejuvenation. These AST protocols provide a strategic reference for filler-based injections to improve NLFs but are not restrictive. Thus, injectors should assess and treat patients using a personalized approach. Using indirect and direct injections, the AST protocols effectively leveraged and combined CPM HA fillers to achieve NLF correction and holistic pan-facial rejuvenation.

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DISCLOSURES

Li, Tseng, Cui, Liu, Xue, van Loghem, Hung, Zhou, Xie, and Zhao each serve as consultants and speakers for Merz Aesthetics. Funding was provided by Merz Aesthetics for manuscript writing support to Dr Shawna Tan, Medical Writers Asia.

PATIENT CONSENT

Informed consent was obtained from all individual participants included in the study.

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DECLARATION OF HELSINKI

All protocols adhered to the tenets of the Declaration of Helsinki.

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