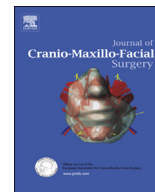




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# “Non-filling” procedures for lip augmentation: A systematic review of contemporary techniques and their outcomes

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## ABSTRACT

**Background:** Ideal lip augmentation techniques have good longevity, low complication rates, and optimal functional and aesthetic results. No systematic review is currently available regarding the efficacy of lip augmentation techniques. This review will focus only on non-filling procedures for lip augmentation (NFPLAs).

**Methods:** Current databases Elsevier Science Direct, PubMed, HighWire Press, Springer Standard Collection, SAGE, DOAJ, Sweetswise, Free E-Journals, Ovid Lippincott Williams & Wilkins, Wiley Online Library Journals and Cochrane Plus were scrutinized and relevant article reference sections were studied for additional publications. The search heading sequence used was (“Lip” or “Mouth” or “Perioral” or “Nasolabial”) and (“Augmentation” or “Enhancement” or “Surgery” or “Lift” or “V–Y” or “Corner”).

**Results:** Exclusion criteria applied to 6436 initial keyword-search retrievals yielded 12 articles. Eight more articles were retrieved from reference sections, for a total of 18 papers assessed. Only one article made a direct comparison of efficacy between two surgical techniques for lip augmentation, and none directly compared complications associated with different NFPLAs.

**Conclusions:** Although this systematic review revealed a lack of quality data in comparing the efficacy and complications among different NFPLAs, it is important to review and pool the existing studies to better suggest proper treatment to patients.

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## 1. Introduction

When images of the human body are shown to observers, attention to the face is much greater (73%) than to other anatomical parts (Massaro et al., 2012). Attraction to the face is relevant because it represents a cue to a person's identity, health and emotional state, attitude, and gender, which are crucial factors of social interaction (Aharon et al., 2001). When looking at a human face, an observer usually pays attention first to the eyes, then the lips, and finally the nose. The other facial parts are given more cursory consideration. When photographs of a smiling face are shown, the lips attract far more attention than the eyes, according to eye movement registrations (Yarbus, 1961). The impact of the lips in identity recognition has been investigated and, when the number of subjects is  $\leq 29$ , the correct identity recognition rate solely by viewing the lips is greater than 98% (Liu et al., 2012).

Nowadays, pouty and bulky lips, emphasizing the upper lip, are generally considered more beautiful. However, the most highly rated in attractiveness are lips that have a relatively thinner upper lip, a significant contrast to the current trend of enhancing upper lip volume for increasing youth fullness and beauty (Wong et al., 2010).

During ageing, lips undergo volume, length, shape, and colour transformations. Recent histological and MRI studies (Iblher et al., 2012) have highlighted redistribution from thickness to length without total volume loss, in contrast to what was previously thought (Rozner and Isaacs, 1981; Hinderer, 1995; Santachè and Bonarrigo, 2004), and a decrease of structural components, which leads to decreased pouting, vermilion inversion, and ptosis. A long lip can also appear in young people as a phenotypic variation, as well as in patients who have undergone rhinoplasty, lip fillers, Le Fort I advancement with iatrogenic vertical maxillary deficiency (Jeter and Nishioka, 1988), or facial palsy. Lip lift techniques try to solve this problem.

Two groups of surgical procedures that assure labial augmentation and vermilion eversion are currently enjoying increasing popularity, one without volume addition, i.e., non-filling

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procedures for lip augmentation (NFPLAs) and the other employing volume addition (FPLAs). This systematic review will only focus on NFPLAs, covering four surgical techniques: the direct lip lift (DLL), indirect lip lift (ILL), corner of the mouth lift (CML), and the V–Y lip advancement (VYLA).

## 2. Material and methods

### 2.1. Literature search

The systematic literature search [shown as a QUOROM-flow diagram (Moher et al., 1999) in Fig. 1] was started with the assistance of Unika Library Service from the University of Navarre (Clínica Universitaria de Navarra), Pamplona, Spain. This Service allowed the authors to search diverse scientific databases including Elsevier Science Direct Complete, PubMed Central, HighWire Press, Springer Standard Collection, SAGE premier 2011, DOAJ Directory of Open Access Journals, Sweetswise, Free E-Journals, Ovid Lippincott Williams & Wilkins total Access Collection, Wiley Online Library Journals, and Cochrane Plus. The search heading sequence used was (“Lip” or “Mouth” or “Perioral” or “Nasolabial”) and (“Augmentation” or “Enhancement” or “Surgery” or “Lift” or “V–Y” or “Corner”). Articles published in all languages were included. Our initial search returned 6436 published articles (1960–July 2013). Inclusion criteria mandated only academic publications, decreasing the number of articles to 1001. Articles discussing non-human subjects or a different topic were excluded, further decreasing potential article numbers to 173. Articles discussing cleft lip, other lip pathologies, and lip augmentation techniques that use fillers or grafts were excluded, leaving 25 articles. Only 11 out of these 25 articles fulfilled inclusion criteria 3 and 4 (see selection criteria in next paragraph). The references of these 11 selected publications on Lip

Lift or V–Y advancement were manually searched, initially yielding 17 additional articles about NFPLA; however only 7 of them fulfilled inclusion criteria 3 and 4. With the addition of these 7 articles, a total of 18 articles were included in this systematic review. The primary findings of these studies are summarized in Table 1.

### 2.2. Study selection criteria

The following inclusion criteria were used to select potential articles from the published abstract search results: 1) human patients; 2) lips without pathology or patients without pathology that could be ameliorated by lip enhancement; 3) only lip augmentation techniques that did not use fillers or grafts; 4) patients' numbers must have been cited, and articles with >8 patients were excluded; and 5) complication rates or quantitative efficacy outcomes must have been reported.

Articles that met all inclusion criteria were divided into four groups according to the method of surgical lip augmentation: DLL, ILL, CML, or VYLA. If we restricted ourselves to an accurate meaning of “NFPLA”, we could also include in this set botulinum toxin techniques used for lip enhancement and lip pigmentation techniques, since these techniques do not “fill” the lip. Nevertheless, they should be considered apart, due to the lack of resemblance with the NFPLAs discussed in this paper.

One article provided the number of patients in its study, but was not included in our systematic review analysis due to a lack of data regarding the number of complications and outcomes (Hinderer, 1995). Two publications of the same patient group for the same postoperative follow-up period were analysed jointly because there was no patient loss during follow-up and the reported complications were complementary, with no overlapping data (Guerrissi and Sánchez, 1993; Guerrissi, 2000).

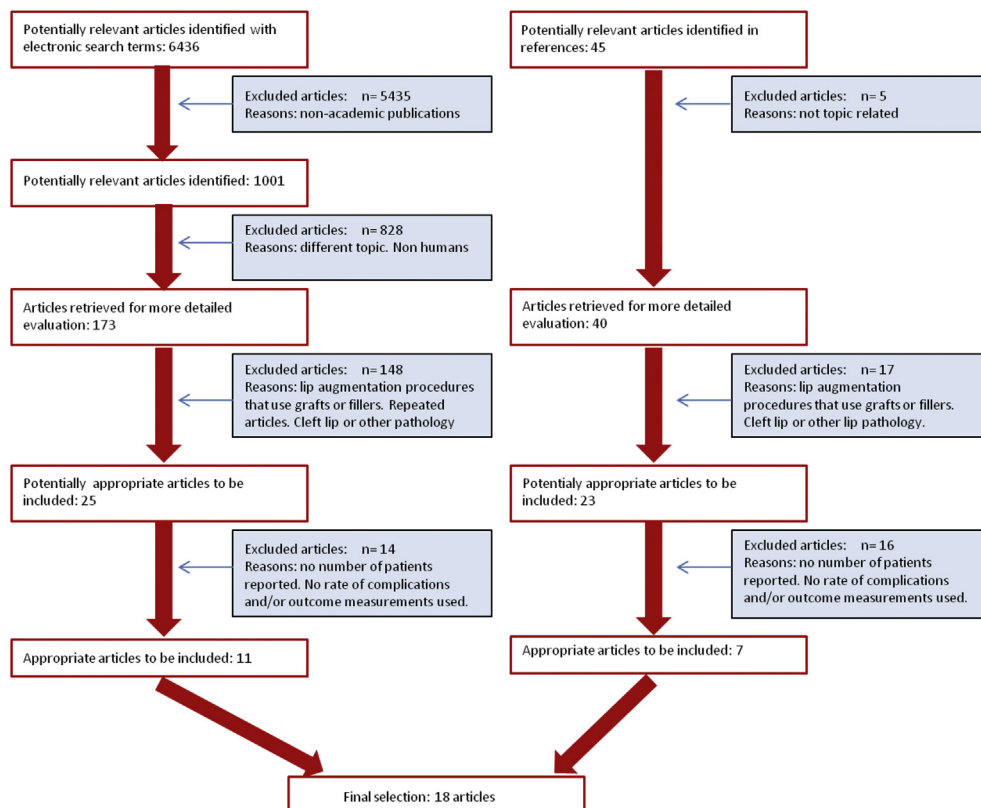


Fig. 1. Flow diagram according to QUOROM statement (Moher et al., 1999) providing information about the number of articles identified, included, and excluded and the reasons for excluding them.

**Table 1**  
Selected studies.

| Reference                      | Technique   | LOE | No of patients           | Mean age                                | Sex (% women) | Efficacy outcome measurement                       | Follow-up duration   | Control | Blinded        |
|--------------------------------|---|-----|--------------------------|---|---------------|--|----------------------|---------|----------------|
| 1 Rozner and Isaacs, 1981      | ILL (snbhi)   | IV  | 171                      | Unknown                                 | Unknown       | Surgeon's "eye"                                    | Not clear            | No      | No             |
| 2 Fanous, 1984                 | DLL   | IV  | 32                       | Unknown                                 | 100%          | Surgeon's "eye".                                   | 4 months–3 years     | No      | No             |
| 3 Austin, 1986                 | DLL/ILL   | IV  | 94 (11/83 <sup>a</sup> ) | Unknown                                 | Unknown       | Surgeon's "eye"                                    | Not clear            | No      | No             |
| 4 Guerrissi and Sánchez, 1993  | DLL with dermal flat fixed onto orbicularis oris            | IV  | 19                       | Range 42–71                             | Unknown       | Surgeon's and patient's "eye"                      | 5 years              | No      | No             |
| 5 Guerrissi, 2000              | ILL extended  | IV  | 12                       | Range 56–70                             | 100%          | Surgeon's "eye"                                    | Not clear            | No      | No             |
| 6 Marques and Brenda, 1994     | ILL Italian   | IV  | 60                       | Unknown                                 | 91.6%         | Surgeon's and patient's "eye".                     | Not clear            | No      | No             |
| 7 Santachè and Bonarrigo, 2004 | CML   | IV  | 27                       | 61.3% <sup>a</sup><br>69.2 <sup>a</sup> | 88.9%         | Patient's satisfaction survey                      | 3 months–1 year      | No      | No             |
| 8 Parsa et al., 2010           | ILL (snbhi)   | IV  | 22                       | 55                                      | Unknown       | Scar grade   | Not clear            | No      | No             |
| 9 Penna et al., 2010           | ILL upper lip suspension technique                          | IV  | 92                       | 34                                      | 96.7%         | Photographic analysis of anthropometric ratios     | 2–26 months (mean10) | No      | Not clear      |
| 10 Echo et al., 2011           | DLL/ILL   | IIb | 30 (15/15 <sup>a</sup> ) | UK<br>UK                                | Unknown       | Photographic analysis of anatomic ratios           | 51 months            | Yes     | No             |
| 11 Holden et al., 2011         | ILL "double duck" technique                                 | IV  | 10                       | 55.2                                    | 90%           | Surgeon's "eye"                                    | 12 months            | No      | No             |
| 12 Cardim et al., 2011         | W shaped V–Y advancement                                    | IV  | 15                       | Unknown                                 | Unknown       | Surgeon's "eye"                                    | Unknown              | No      | No             |
| 13 Aiache, 1991                | W shaped V–Y advancement                                    | IV  | 8                        | Unknown                                 | Unknown       | Surgeon's and patient's "eye"                      | 6–18 months          | No      | No             |
| 14 Samiian, 1993               | Double and triple V–Y advancement                           | IV  | 14                       | Unknown                                 | 92.8%         | Surgeon's "eye".                                   | 1–3 years            | No      | No             |
| 15 Ho, 1994                    | W shaped V–Y advancement                                    | IV  | 8                        | 32                                      | 75%           | Digital photographs using digital imaging software | 7–20 months          | No      | Single-blinded |
| 16 Jacono and Quartela, 2004   | W shaped V–Y advancement                                    | IV  | 106                      | Unknown                                 | Unknown       | Surgeon's and patient's "eye"                      | 1–7 years            | No      | No             |
| 17 Haworth, 2004               | W shaped V–Y advancement along with autologous fat transfer | IV  | 46                       | 23                                      | 100%          | Surgeon's "eye"                                    | 2 years              | No      | No             |
| 18 Mutaf, 2006                 | V–Y in V–Y advancement**                                    | IV  | 46                       | 23                                      | 100%          | Surgeon's "eye"                                    | 2 years              | No      | No             |

Abbreviations: LOE, level of evidence; ILL, indirect lip lift; snbhi, DLL, direct lip lift; CML, corner of the mouth lift.

None of the studies used randomization; all were retrospective.

<sup>a</sup> With Greenwald (1987) incision.

\*\* With Parsa et al. (2010) extended incision.

### 2.3. Data extraction

The following data were extracted from the full-text articles: year of publication, study design, follow-up duration, patient number, mean age and gender, types and subtypes of NFPLA, presence of confounding factors, complication rates, changes in postoperative upper and lower lip landmarks, patient satisfaction surveys of scarring satisfaction, and inclusion and exclusion criteria (Table 1).

To assess the methodological soundness of each article, a quality evaluation was performed using the Level of Evidence (LOE) scale, according to the 2011 Oxford CEBM levels of evidence (Howick et al., 2011; Guyatt, 2008) recommendations. The quality of the data was categorized from levels I to IV. Level V studies were not included in the analysis (Table 1).

## 3. Results






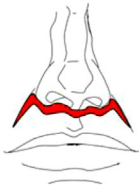
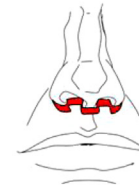


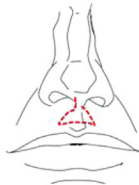

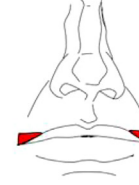
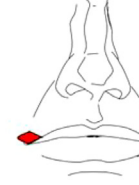
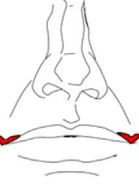


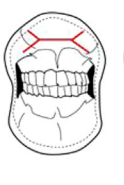
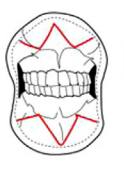
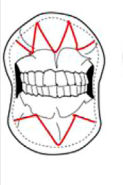
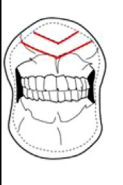
### 3.1. Techniques and variations

A spectrum of classic surgical interventions has been neglected because of the attention shift to filler techniques. Moreover, claims

made by some surgeons during the 1990's (Wilkinson, 1994) consigned some of these techniques to oblivion. Beginning in 2002, new lip augmentation approaches that diminish the rate of scarring started to emerge, and there is currently a renewed interest in lip lift and V–Y lip augmentation techniques. These procedures however, specifically the lip lift, are the only techniques that can reduce the senile white show in an elongated ageing lip. All variations of these techniques are summarized in Fig. 2.

### 3.2. Direct lip lift (DLL)

The first publication about the DLL technique was by Meyer in 1976. This consists of removing the white skin surrounding the upper and lower lips by making incisions along old and new vermilion borders of the upper and lower lip (Meyer and Kesslering, 1976). This technique has been used by several surgeons (Fanous, 1984; Austin, 1986; Kesslering, 1986; Guerrissi and Sánchez, 1993; Felman, 1993; Guerrissi, 2000; Yoskovithch and Fanous, 2003; Holden et al., 2011; Ponsky and Guyuron, 2011) and has also been labelled the "vermillion lip lift" or "gull wing lip lift". One additional millimetre (mm) of overcorrection can be added, since the new vermilion will droop downwards by approximately 1–1.5 mm

| Schematic representation of all different types of NFPLA to date.                   |   |   |  |   |
|---|---|---|--|---|
|    |    |    |    |    |
| DLL, upper and lower lip (Meyer and Kessering, 1976)                                | ILL, bullhorn subnasal lip lift (Cardoso and Sperli, 1971)                          | ILL, philtrum stretching, variation #1 (Austin 1986)                                | ILL, philtrum stretching, variation #2 (Austin 1986)                                 | ILL, L-shaped philtrum lift (González-Ulloa, 1975, 1979)                              |
|    |    |    |    |    |
| ILL, extended incision (Marques and Brenda, 1994)                                   | ILL, Greenwald incision (Greenwald, 1987)   | ILL, double duck suspension (Cardim et al., 2011)                                   | ILL, italian technique (Santachè and Bonarrigo, 2004)                                | ILL, non-scar suspension technique (Echo et al., 2011)                                |
|   |   |   |   |   |
| CML, lentoid incision (Greenwald 1985)  | CML, triangular incision (Austin, 1994)   | CML, rhomboidal incision (Perkins, 2007)  | CML, Valentine anguloplasty (Ching and Flowers, 2005)                                | CML, extended incision (Parsa et al 2010)   |
|  |  |  |  |  |
| CML, lentoid excision for correction of "sad pleats" (Borges, 1989)                 | VYLA, transverse Y-V (Delerme and Elbaz, 1975)                                      | VYLA, double V-Y (Aiache, 1991)   | VYLA, W-shaped incision (Ho, 1994)   | VYLA, V-Y in V-Y incision (Mutaf, 2006)   |

**Fig. 2.** Red compact lines: line of incision. Each type of VYLA surgery includes two images, which correspond to before and after the plasties are performed. Red dotted lines: trajectory of suspension thread (Echo et al., 2011). Red compact areas: areas of skin excision. Abbreviations: DLL (Direct Lip Lift); ILL (Indirect Lip Lift); CML (Corner of the Mouth Lift); Y-V (Y-V plasty); V-Y (V-Y plasty); VYLA (V-Y Lip Augmentation).

within 6 months postoperatively (Fanous, 1984; Yoskovitch and Fanous, 2003). An additional autologous dermis graft can be placed just superficial to the orbicularis oris muscle in the sub- vermilion area (Kesslerling, 1986) or beneath the upper lip skin (Guerrissi and Sánchez, 1993; Guerrissi, 2000) after undermining is performed, to achieve additional fullness.

### 3.3. Indirect lip lift (ILL)

In 1971, a new ILL technique for enhancing ageing lips (Cardoso and Sperli, 1971) was accomplished by excising a wavy ellipse of

upper lip skin so that the scar is located, and hidden, at the base of the nose. This is by far the most used ILL technique (Pitanguy, 1978; Rozner and Isaacs, 1981; Austin, 1986; Wilkinson, 1994; Maloney, 1996; Niechajev, 2000; Hoefflin, 2002; Yoskovitch and Fanous, 2003; Ramírez et al., 2003; Perenack, 2005; Waldman, 2007; Penna et al., 2010; Holden et al., 2011; Ponsky and Guyuron, 2011; Jeter and Nishioka, 1988), and has also been labelled the "bullhorn lip lift" due to the shape of the incision. Numerous variations of this technique have since been described. ILL can be performed with an additional insertion of pre-temporal areolar graft tissue taken during rhytidectomy and affixed to the nasolabial

folds (Hinderer, 1995). An “L-shaped lip lift” or “philtrum lip lift” consisting of a bilateral resection of an area of skin beneath the nose and along the ridge of the philtrum was proposed (González-Ulloa, 1975, 1979). A bullhorn excision that added an inverted triangular vertical midline excision was proposed by Austin for patients with a wide philtrum (Austin, 1986), as was a bullhorn excision adding a wide vertical midline excision if the cupid bow is absent. Another ILL technique consists of lifting the upper lip using a single extensive incision, from the labial commissure along the juxta-nasal part of the lip, to reduce a droopy nasolabial fold (Marques and Brenda, 1994). All of these variations have the risk of producing a visible scar. Some variations of the bullhorn lip lift try to avoid this pitfall. In 1987, Greenwald proposed an incision that preserves the nostril sills, has a horizontal upper margin from alar crease to alar crease, going through the crease on the inferior margin of the nostril sills and through the nasolabial angle at the base of the columella (Greenwald, 1987). The Greenwald incision has given rise to two variations which preserve the skin beneath the columella: one with a strip of adjacent orbicularis muscle cut away (“Italian lip lift”; Santachè and Bonarrigo, 2004), and the other preserving the orbicularis muscle, which decreases the nasolabial angle (“double duck nasolabial lifting”; Cardim et al., 2011). The upper lip suspension technique proposed by Echo et al. does not employ any skin excision and is instead achieved by an intranasal approach, passing a suture through the anterior aspect of the orbicularis oris muscle and anchoring it to the caudal septum/anterior nasal spine (Echo et al., 2011).

#### 3.4. Corner of the mouth lift (CML)

Greenwald introduced the CML in 1985 as the “cheilopexy for cheiloptosis” technique, which consists of a lenticular excision of the white skin surrounding the upper oral commissure (Greenwald, 1985). A triangular-shaped incision variation was later proposed by Austin (Austin, 1994) in cases where the commissures of the mouth require further lifting, but this technique can lead to some excess skin wrapping around the corner of the mouth into the lateral lower lip margin (Poindexter et al., 2003; Weston et al., 2009). A rhomboidal variation (Perkins, 2007) and a “spearhead shape variation” (also called “valentine anguloplasty”; Ching and Flowers, 2005) have also been proposed; however, they frequently result in excessive upward tilting of the mouth corners (Parsa et al., 2010). In order to correct the commonly associated marionette folds of a “frowning mouth”, an extended lenticular incision was proposed (Parsa et al., 2010). This approach consists in a combination of the incision proposed by Greenwald with the one proposed by Borges in 1989 for correcting the “sad pleats” (furrows that arise from the commissures of the mouth and run downward, obliquely, and laterally), resulting in a lentoid skin excision over the bulge (Borges, 1989).

#### 3.5. V–Y lip augmentation (VYLA)

A technique for augmentation cheiloplasty using a double Y–V transverse flap advancement was first described in 1975 (Delerm and Elbaz, 1975), and was subsequently used by other surgeons (Lassus, 1981, 1992). The Y–V approach consists of incising the lip vestibule mucosa in a “V” shape and then closing it in a “Y” shape, resulting in a large protrusion in the central part of the vermillion at the expense of somewhat decreasing the transverse length of the lips. The white show does not change in length. A modification of this technique added a fascia temporalis graft to obtain a pulpy lip (Lassus, 1981). In 1991, Aiache described the “W-shaped V–Y advancement” creating one or two sets of “W” incisions with their bases towards the lip sulcus and their tips toward the vermillion-

mucosal junction (Aiache, 1991). This technique is suitable for patients with some shortness of the lip and a thin vermillion border. Protrusion in the lateral parts of the lip is also achieved with this technique (Aiache, 1991; Samiian, 1993; Jacono and Quartela, 2004). In 1994, Ho described a new technique similar to the one of Aiache, making three large V incisions in the upper lip, with gaps between the ends of adjacent limbs of the Vs corresponding to the arches between the middle and lateral segments of the upper lip. On the lower lip, two medial limbs of the Vs are performed corresponding to the position of the notch in the midline of the lower lip vermillion (Ho, 1994). This technique preserves the natural contours of the upper lip in the central papilla and the double arches between the central and lateral lip segments (Ho, 1994; Haworth, 2004; Mestak, 2002) and has also been performed along with fat transfer (Jacono and Quartela, 2004; Haworth, 2004). In 2006, Mutaf proposed the “V–Y in V–Y procedure” to augment the upper lip. Two vertically parallel V-shaped incisions placed in a “V in V” fashion are used, providing simultaneous remarkable protrusion and augmentation of the upper lip, thus having potential as an adjunct procedure for correcting the facial profile of patients with mild prognathia who wish to avoid orthognathic surgery (Mutaf, 2006).

#### 3.6. Study type

A Level of Evidence (LOE) number was assigned to each selected study according to the 2011 Oxford CEBM levels of evidence (Howick et al., 2011; Guyatt, 2008). All except one article had a level IV of evidence owing to the poor quality data defining comparison groups, failing to measure exposures and outcomes, and/or failing to identify known confounders. Only one article has a level IIb of evidence and is the only study that employed a control group (Holden et al., 2011). All of the articles are retrospective, and no randomization was used in any study. Only one study used a single-blinded analysis of the outcome data (Jacono and Quartela, 2004). This study was blinded in that the patients had a VYLA of one lip and a different procedure, such as a dermal fat graft, performed on the other lip at the same time, thus the operations were performed under general anaesthesia.

#### 3.7. Age, sex, inclusion and exclusion criteria, and follow-up

The mean age for ILL techniques is only provided in three studies, with an overall mean age of 48 years (Penna et al., 2010; Echo et al., 2011; Cardim et al., 2011). It should be noted that the average age in the upper lip suspension technique (Echo et al., 2011) is 34 years, causing a downward deviation of the ILL mean age to the left. In this case, the median age of 55 years old for all ILL patients appears to be a more useful measure of central tendency. One DLL study provided the patient age range (42–71 years old), but not the mean or median age (Guerrissi and Sánchez, 1993). Only one CML study provided the age of the patients, with a mean of 61.3 years for patients who underwent the Greenwald excision and 69 years old for patients who underwent the extended excision proposed by Parsa (Parsa et al., 2010). The VYLA approach appears to be the preferred technique for young patients, with an overall mean age of 27.5 years old (Jacono and Quartela, 2004; Mutaf, 2006).

The sex of the patients that undergo these surgical procedures is predominantly female, although sex was only reported in 9 of 18 selected studies. Women comprised 94.5%, 100%, 88.9% and 89.2% of patients undergoing ILL (Marques and Brenda, 1994; Santachè and Bonarrigo, 2004; Penna et al., 2010; Cardim et al., 2011), DLL (Fanous, 1984), CML (Parsa et al., 2010) and VYLA (Ho, 1994; Jacono and Quartela, 2004; Mutaf, 2006) procedures, respectively.

Although the majority of the articles about ILL or DLL discuss the changes in the senile lip, this variable was not clearly submitted as a selection criteria in these studies. In one study (Echo et al., 2011), all patients that were thought to have a long upper lip in relation to their facial aesthetics preoperatively were included. In another study (Cardim et al., 2011), the inclusion criteria were excessive vertical dimension of the upper lip skin with thinning of the vermilion. Nevertheless, none of these articles has qualitatively measured this “excessive upper lip skin” when including patients in their studies. Only Holden et al. (2011) measured upper skin length, although he does not report at what point (i.e., how many millimetres) a lip is considered long, and therefore did not use upper skin length as an inclusion criterion. In one CML study (Parsa et al., 2010), isolated sagginess of the corner of the mouth or associated marionette folds were used as inclusion criteria. Inclusion criteria for VYLA procedure selection are not defined in any article that we reviewed. Only Haworth suggested that lip inversion ascertained in the lateral view can be an indication for VYLA, but it's not clear if he used this indication for the inclusion of the cases. Additionally, this study did not provide a quantitative definition of an “inverted lip” (Haworth,

2004). Jacono operated on 8 patients that desired “poutier” lips (Jacono and Quartela, 2004), although the difference between “pouty” and “non-pouty” is not detailed.

Exclusion criteria were only reported in one article which compared the efficacy of ILL with DLL. Patients who had undergone other cosmetic procedures involving the nose or the perioral regions, and patients who had undergone ILL and DLL in combination, were excluded in this study (Holden et al., 2011).

Follow-up is only reported in 11 out of 18 scrutinized articles. For ILL, the mean follow-up was 24 months (Echo et al., 2011; Holden et al., 2011; Cardim et al., 2011). DLL had a longer follow-up period of 55.5 months (Guerrissi and Sánchez, 1993; Holden et al., 2011), and a range of 4–36 months (Fanous, 1984). For CML the follow-up ranged from 3 to 12 months (Parsa et al., 2010). The range of follow-up in VYLA papers was 3.75 months–25.75 months (Samiian, 1993; Ho, 1994; Jacono and Quartela, 2004; Haworth, 2004), with a mean of 17.5 months (Jacono and Quartela, 2004; Mutaf, 2006). For combined DLL/ILL, only one study reported long-term results (Holden et al., 2011). Only one CML study reported long-term results (Parsa et al., 2010), and no long-term results were reported in VYLA studies.

**Table 2**  
Outcomes.

| Study                     | Technique                          | Outcome measurement                                | Specific measurements  | Outcomes          | Change (%) | p-value |
|---------------------------|------------------------------------|--|--|-------------------|------------|---------|
| Parsa et al., 2010        | CML                                | Patient's satisfaction survey<br>Scar Grade        | Women satisfied with the scars 1 year after the surgery with make-up     | 89.5 <sup>a</sup> | –          | –       |
|                           |                                    |  | 87.5 <sup>a</sup>  | –                 | –          |         |
|                           |                                    |  | Women satisfied with the scars 1 year after the surgery without make-up: | Impr              | –          | >0.05*  |
|                           |                                    |  | 84.2 <sup>a</sup>  | –                 | –          |         |
|                           |                                    |  | Comparison of women satisfaction with and without make-up after 1 year   | Impr              | –          | <0.05   |
|                           |                                    |  | Women satisfied with procedure in the first 6 months with make-up        | 89.5 <sup>a</sup> | –          | –       |
|                           |                                    |  | 100 <sup>a</sup>   | –                 | –          |         |
|                           |                                    |  | Women satisfied with procedure in the first 6 months without make-up     | 100 <sup>a</sup>  | –          | –       |
|                           |                                    |  | 100 <sup>a</sup>   | –                 | –          |         |
|                           |                                    |  | Comparison of women satisfaction with and without make-up after 6 months | 100 <sup>a</sup>  | –          | –       |
|                           |                                    |  | Women satisfied with overall outcome                                     | –                 | –          | –       |
|                           |                                    |  | Men satisfied with the overall outcome                                   | –                 | –          | –       |
|                           |                                    |  | Men satisfied with procedure in the first 6 months                       | –                 | –          | –       |
|                           |                                    |  | Men satisfied with the scars 1 year after the surgery                    | –                 | –          | –       |
| Penna et al., 2010        | ILL (snbhi)                        | Photographic analysis of anthropometric ratios     | Total upper lip length (Sto-Sn):   | Dec               | n.a.       | <0.001  |
|                           |                                    |  | Prolabium length upper lip (Sn-Ls):                                      | Dec               | n.a.       | <0.001  |
|                           |                                    |  | Vermillion height upper lip (Sto-Ls):                                    | Inc               | n.a.       | <0.01   |
|                           |                                    |  | Nasolabial angle ((Ls-Sn)(Sn-Cm)):                                       | Dec               | n.a.       | <0.05   |
| Echo et al., 2011         | ILL upper lip suspension technique | Four-parameter scale                               | Lip height shortened   | Dec               | –15        | n.a.    |
|                           |                                    |  | Sagittal projection pout improved  | Inc               | 79         | n.a.    |
|                           |                                    |  | Incisor show increased   | Inc               | 74         | n.a.    |
|                           |                                    |  | Increased vermilion show   | Inc               | 25         | n.a.    |
|                           |                                    |  | Medial upper white lip length ratio ((Sn-Ls)/L1)                         | Dec               | –18        | 0.001   |
| Holden et al., 2011       | DLL                                | Photographic analysis of anatomic ratios.          | Lateral upper white lip length (Sn <sup>P</sup> -Ls'/L1)                 | Dec               | –20        | 0.001   |
|                           |                                    |  | Medial upper white lip length ratio ((Sn-Ls)/L1)                         | Dec               | –1.5       | 0.001   |
| Jacono and Quartela, 2004 | W shaped V–Y advancement           | Digital photographs using digital imaging software | Medial upper white lip length (Sn-Ls):((Sn-Ls)/L1)                       | Dec               | –7.8       | 0.23*   |
|                           |                                    |  | Lateral upper white lip length (Sn <sup>P</sup> -Ls')                    | Dec               | –15.1      | 0.11*   |
|                           |                                    |  | Lateral upper red lip length (Sto <sup>P</sup> -Ls')                     | Inc               | 75         | 0.02    |
|                           |                                    |  | Medial upper red lip length (Sto-Ls):                                    | Inc               | 55         | 0.001   |
|                           |                                    |  | Upper red lip area   | Inc               | 66         | 0.04    |
|                           |                                    |  | Upper lip projection (Ls-Ls <sup>P</sup> )                               | Inc               | 39         | 0.03    |
|                           |                                    |  | Lateral upper red lip area   | Inc               | 69         | 0.04    |
|                           |                                    |  | Apex to trough cupid's bow   | Inc               | 56.7       | 0.001   |
|                           |                                    |  | Lower lip projection (Li-Li <sup>P</sup> )                               | Inc               | 48.7       | 0.01    |
|                           |                                    |  | Lower red lip area   | Inc               | 33         | 0.37*   |
|                           |                                    |  | Lateral lower red lip area   | Inc               | 45.0       | 0.14*   |

\*Non-statistically significant difference.

Abbreviations: CML, corner of the mouth lift; Dec, decrease; DLL, direct lip lift; ILL, indirect lip lift; Inc, increase; Impr, improvement; Ls, Superior medial labial point; Ls', superior lateral labial point; Li, inferior medial labial point; Li<sup>P</sup>, inferior lateral labial point; Sn, subnasal point; Sn<sup>P</sup>, subnasal projected; sto, stomion; cm, columella; n.a., data not available.

<sup>a</sup> Percentage of patients satisfied with the appearance of the scar.

### 3.8. Outcomes

Only 5 out of the 18 articles discussed in this systematic review submitted objective and measurable data regarding the effectiveness of different labial augmentation procedures, and all of them were published after 2003 (Table 2). Technique effectiveness and outcome in the remainder of the studied papers were only based on the surgeons' or the patients' "eye", with no objective measurement available. Two of these 5 articles submitted their outcomes using a subjective measurement, and only 3 articles provided objective anthropometric measurements. One article (Parsa et al., 2010) reported the subjective outcome evaluation as a patient satisfaction survey of scar scale for evaluating CML effectiveness 6 months and 1 year after surgery, with and without the use of make-up (for evaluating men's opinions, make-up was not taken into account). All categories showed >80% satisfaction with the sole exception that only 22.3% of women were satisfied with the procedure in the first 6 months without make-up versus when wearing make-up ( $p < 0.05$ ). Patient satisfaction after 1 year was similarly >80% in all groups ( $p > 0.05$ ). The other study (Echo et al., 2011) that submitted subjective evaluation of the results compared pre- and post-operative photographs after ILL surgery (upper lip suspension technique) on a four-category scale. In each category the surgeon was asked to classify the lip as showing improvement versus no change. Where the result presented a discrepancy, it was decided by a two-thirds majority vote by the surgeons. The results showed 85% of the patients had shortened total lip height, 79% showed sagittal projection pout, 74% showed increased incisor show, and 25% showed increased vermilion show. Neither confidence intervals nor  $p$ -values were reported.

The three remaining articles set out the effectiveness of the techniques in terms of anthropometric data, measured in millimetres, although one article presents ratios (Holden et al., 2011). Within these three articles, one refers to V–Y lip augmentation (Jacono and Quartela, 2004), another refers to ILL with a bullhorn incision approach (Penna et al., 2010), and the third one compared DLL with ILL techniques (Holden et al., 2011), the latter being the only available article that compared two surgical lip augmentation techniques. Medial white upper lip length is the only anthropometric measurement that was evaluated in three different techniques (DLL, ILL, and VYLA), showing a statistically significant decrease after surgery in DLL ( $p < 0.001$ ; Holden et al., 2011) and in ILL ( $p < 0.001$ ; Penna et al., 2010; Holden et al., 2011), but no statistically significant change after VYLA surgery ( $p = 0.23$ ; Jacono and Quartela, 2004). A significant increase in medial red upper lip length was observed in ILL ( $p < 0.01$ ; Penna et al., 2010), and VYLA showed a 55% increase ( $p < 0.001$ ; Jacono and Quartela, 2004). Total upper lip length was decreased in ILL after surgery ( $p < 0.001$ ; Penna et al., 2010). Lateral white upper lip length showed a decrease in DLL ( $p < 0.001$ ; Holden et al., 2011), but showed no change after VYLA ( $p = 0.11$ ; Jacono and Quartela, 2004). Lateral red upper lip length is increased after VYLA ( $p < 0.05$ ; Jacono and Quartela, 2004). Upper lip projection was increased after ILL ( $p < 0.05$ ; Penna et al., 2010), and showed in a 39% increase after VYLA ( $p < 0.05$ ; Jacono and Quartela, 2004). Upper lip area, lateral upper lip area, and lower lip projection showed respective 66%, 69%, and 48.7% increases after VYLA ( $p < 0.05$ ; Jacono and Quartela, 2004), but no change was found in lower red lip area ( $p = 0.37$ ) or lateral lower red lip area ( $p = 0.14$ ) after VYLA likely because only 4 patients out of 8 were also operated on the lower lip in that study.

### 3.9. Complications

Although almost every study found on lip lift or V–Y augmentation talks about the possible range of complications that can be

found after these surgical procedures, only 16 articles submitted data detailing the number of patients that suffered from specific complications (Table 3).

DLL surgery technique led to the following complications: asymmetry of the shape of the lips (6% with posterior revision, Fanous, 1984; 5%, Guerrissi, 2000; and 13%, Holden et al., 2011), hypertrophic scarring (3%, which required steroid injection, Fanous, 1984; 27%, Austin, 1986; and 5%, Guerrissi and Sánchez, 1993), under correction or less lip augmentation than expected (6.25%, which required revision, Fanous, 1984; and 26%, Guerrissi, 2000), and infection (5% inflammatory miliaria, Guerrissi and Sánchez, 1993).

In ILL surgery, the complications included hypertrophic scarring (5.3%, Austin, 1986) and 20% corrected with dermabrasion (Holden et al., 2011), under correction (2.4%, which required revision, Austin, 1992, 1986), infection (1.6%, Santachè and Bonarrigo, 2004), suture abscess that required revision (2.1%, Echo et al., 2011), long lasting oedema (8.3% for 3 months, Marques and Brenda, 1994; and 10% for 1 month, Cardim et al., 2011), unravelled sutures (1%, occurring 2 days after operation; Echo et al., 2011), and a 0% rate of anaesthesia or paralyses (Cardim et al., 2011).

In CML surgery, under correction (4%), infection (4%), revision (7%), hypertrophic scarring (15%) and depressed scarring (7%) were reported as complications in only one study (Parsa et al., 2010).

With V–Y lip advancement, the following complications were found: oedema (100% extreme, Aiache, 1991; 9.4% debilitating for 3 weeks, Haworth, 2004; and 79% that led to difficulty in eating or articulating words, and the inability to suck and purse one's lips, Haworth, 2004), asymmetry with posterior revision (25%, Samiian, 1993; and 2.8%, Haworth, 2004), under correction (12% that required injection of Zyplast® (purified bovine collagen; Samiian, 1993; 21%, Ho, 1994; 7%, Haworth, 2004; and 4%, Mutaf, 2006), Overcorrection (3% desired less volume, Haworth, 2004), paraesthesia (12%, Samiian, 1993), hypoesthesia (7%, Ho, 1994; 0%, Haworth, 2004 and Mutaf, 2006)), no presence of infection or cyst formation (0% cysts, Samiian, 1993; 0% infection, Haworth, 2004 and Mutaf, 2006), dehiscence of the mucosal advancement (6%, Haworth, 2004), and dryness of lips (75%, Haworth, 2004).

Taken together, these results show an increased mean rate of under correction in DLL and VYLA (16% and 11%) compared to ILL and CML (2% and 4%). An increased rate of infection is seen in DLL and CML (5% and 4%) compared to ILL or VYLA (2% and 0% respectively), although a true 0% infection rate in VYLA is unlikely. The rate of revision is lower in ILL (2%) compared to DLL, VYLA, and CML (6%, 10.2%, and 7%, respectively). The rates of hypertrophic visible scarring are very similar in DLL, ILL, and CML (12%, 12%, and 15%, respectively). Asymmetry is a complication of DLL and VYLA (8% and 13%). VYLA shows an increased rate of long lasting oedema compared to ILL (63% vs 9%). Paraesthesia is only reported so far in VYLA (5%), as is overcorrection (3%), dryness of lips (75%), and dehiscence of the mucosal advancement (6%). Depressed scarring is only reported in CML (7%), and unravelled sutures have only been reported in ILL (1%). No paralyses is found in any of the surgical techniques.

## 4. Discussion

Although a multitude of options exist for lip augmentation, it appears that ILL is the preferred NFPLA method. Among the 18 articles describing non-filling/grafting procedures for lip augmentation, 50% used the ILL technique, and only 22%, 8%, and 20% address DLL, CML, or VYLA, respectively.

Scarring seems to be the most feared complication. While VYLA can hide the appearance of a hypertrophic scar in the vestibular aspect of the lips, ILL, DLL, and CML techniques are more likely to

**Table 3**  
Complications.

| Study   | Technique  | Complications   |
|---|--|---|
| Fanous, 1984  | DLL  | 6.25% asymmetry (revision)<br>6.25% under correction (revision)<br>3.1% hypertrophic scar (injection steroid)   |
| Austin, 1986<br>Guerrissi and Sánchez, 1993,<br>Guerrissi, 2000   | DLL/ILL<br>DLL with dermal flat fixed onto orbicularis oris  | DLL: 27.2% hypertrophic scar<br>5% inflammatory miliaria<br>5% hypertrophic scar<br>*26% reduction of initial results (follow-up, 4 years)<br>*5% asymmetry   |
| Holden et al., 2011<br>Rozner and Isaacs, 1981<br>Austin, 1986<br>Marques and Brenda, 1994<br>Santachè and Bonarrigo, 2004<br>Echo et al., 2011 | DLL/ILL<br>ILL (snbhi)<br>DLL/ILL<br>ILL extended<br>ILL reduced<br>ILL Upper lip suspension technique | DLL: 13% asymmetry (revision)<br>5.3% hypertrophic scar<br>ILL: 4% insufficient results (revision)<br>8.3% long-lasting oedema (3 months)<br>1.6% infection<br>1% unravelled suture (2 days after operation)<br>2.1% infection (suture abscess; required revision)  |
| Holden et al., 2011   | DLL/ILL  | ILL: 0% surgical revisions<br>20% hypertrophic scar (corrected with dermabrasion)   |
| Cardim et al., 2011   | ILL “double duck” technique  | 0% anaesthesia<br>0% paralyses<br>10% long-lasting oedema (1 month)   |
| Aiache, 1991<br>Samian, 1993  | W shaped V–Y advancement<br>W shaped V–Y advancement   | 100% extreme swelling of the lips<br>12.5% injection of zyplast<br>12.5% asymmetry (revision)<br>12.5% paraesthesia<br>0% cyst  |
| Ho, 1994  | Double and triple V–Y advancement  | 7.14% hypoaesthesia<br>21.4% repeat volume expansion  |
| Haworth, 2004   | W shaped V–Y advancement along with autologous fat transfer  | 75% dryness of the lips<br>9.4% swelling debilitating 10 weeks<br>79% swelling, difficulty eating, articulating words, pursing lips<br>5.6% dehiscence of the mucosal advancement<br>2.8% asymmetry (revision)<br>0% permanent paraesthesia<br>0% infection<br>7.5% desired mire volume<br>2.8% desired less volume |
| Mutaf, 2006   | V–Y in V–Y advancement   | 4.34% additional volume expansion<br>0% hypoaesthesia<br>0% infections  |

Abbreviations: ILL: indirect lip lift; DLL: direct lip lift, snbhi: subnasal bullhorn incision, F.U. follow-up, yr: year.

cause visible scarring. Although there were no clear differences among the rates of scarring among different NFPLA techniques assessed in this systematic review, we expect that the DLL technique is more likely to result in subtle changes in the transition between the vermilion and the white skin. This technique has always had its detractors, and we think that a completely natural look after this procedure without any trace of surgical scarring is unlikely. Five out of the 6 articles discussed in this review talk about the utility of using lipstick after this surgery. According to [Guerrissi \(2000\)](#), “The scar is hidden in the natural new vermilion border and can be covered easily with the use of lipstick. Most patients accept a youthful lip with a thin scar that may be camouflaged with make-up”. CML can also lead to scarring, and a patient satisfaction survey scar scale for evaluating the effectiveness of CML surgery and a Likert scale for evaluating the amount of scarring have been used in one study. The ILL technique has evolved into multiple surgical variations to deal with the problem of scarring. Since the ILL incision proposed by Greenwald in 1987, three new ILL techniques have appeared in recent years (2004–2012), aimed to minimize the visibility of a scar under the nose. Cumulative ILL results have to be examined very carefully because we have analysed results and complications of all ILL procedures together. However, diverse ILL techniques such as the bullhorn incision, upper lip suspension, double duck suspension, or the Italian incision may have different outcomes and complications from one another.

Paraesthesia is a complication that can occur after a VYLA procedure with a reported probability of 4%, and great care must be

taken to not damage the ramifications of the infraorbital nerve during surgery. Some of the results inferred from our analyses are unlikely, such as a 0% rate of infection after VYLA. Common aerobic and anaerobic bacterial flora of the oral cavity can easily lead to infection. Trans-oral surgery (like VYLA) is a clean-contaminated surgery that has an infection rate ranging from 10% to 15%, which is more than the approximate 2% rate of infection secondary to clean surgery ([Peterson, 1990](#)). By using good surgical techniques, the incidence of infection in class I, or clean surgery cases, can be reduced to less than 1%. In class II surgery, by using excellent technique and prophylactic antibiotics, the incidence of infection can also be reduced to approximately 1% ([Olson et al., 1984](#)). Antibiotic treatment is mentioned only in 2 out of 11 non-VYLA studies; in one it was recommended ([Ho, 1994](#)) and in the other it was not ([Mutaf, 2006](#)), and 9 out of 11 non-VYLA articles do not mention the possibility of antibiotic treatment after surgery.

Due to the lack of selection criteria, most of the studies include patients that also underwent aesthetic procedures in the perioral region. That can act as a confounding factor and distort the outcome measurements because a rhinoplasty, genioplasty, or perioral procedures can stretch or lengthen some of the anthropometric landmarks of the lips. Only one study enacts clear exclusion criteria for patients who had undergone other cosmetic procedures involving the nose or the perioral regions, and for patients who had undergone ILL and DLL in combination ([Holden et al., 2011](#)). In one study ([Rozner and Isaacs, 1981](#)), all the patients underwent rhytidectomy, so the lip lift was a complementary procedure. In another



study (Mutaf, 2006), among 46 patients, 16 had previously undergone rhinoplasty, 2 patients had undergone face lifts, 3 had a history of perioral peeling, and 3 had received genioplasty. In another study (Jacono and Quartela, 2004), four out of eight patients had prior lip augmentation procedures, acellular dermal graft, or dermal fat graft lip augmentation. The results of NFPLA can also be distorted after posterior fat cell transfer to the lip, dermal grafts, or fillers, all of which can act as confounding factors. In one study (Ho, 1994) 10 out of 14 patients had the vermilion correction (VYLA) prior to volume expansion with fat cell transfer 4 weeks later. In another study, all of the 106 patients underwent VYLA and fat transfer (Haworth, 2004). Dermal grafts into the lip were placed simultaneously to the DLL surgery in three studies (Kesslerling, 1986; Guerrissi and Sánchez, 1993; Guerrissi, 2000), and in ILL in one study (Hinderer, 1995).

To best serve the body of literature on this topic, future studies comparing NFPLA surgical treatments of thin lips have a focus on the following principles: first, studies should be prospective whenever possible so that reviewer and recall bias can be counteracted. Then, more explicitly detailed discussion about anticipated quantitative results must be used to better educate the audience on specific pitfalls and positive aspects of any particular procedure or augmentation option. Some authors use the “surgeon’s eye” to evaluate outcomes, which can lead to a self-bias effect. For example, according to Austin (1986): “all of the 83 patients had excellent results”; or according to Samiian (1993): “all the patients expressed their pleasure with the results and did not regret the surgery”. Since 2004, Jacono has evaluated NFPLA results in measurable terms, and this positive scientific trend is even more evident since 2010. However, only one study to date actually compared different NFPLA techniques; Holden et al. (2011) compared the outcomes of DLL and ILL using the classical anthropometric landmarks defined by Farkas et al. (1984). Nonetheless, the level of evidence for outcomes is low in most studies that we reviewed and assessed. Some of these papers reported using novel techniques for the first time, and emphasis was placed more on the surgical procedure itself than in a thorough quantitative analysis of the results, complications, or statistical characteristics of the study. More comparative studies should be carried out to gain a better understanding about the differences in efficacy and complications among the range of available NFPLA techniques.

## 5. Conclusions

Surgical success in lip augmentation may be defined by anthropometric measurements, patient satisfaction, and complication rates. To date, there exists no prospective studies comparing the outcomes of different NFPLA techniques, and only one study in the literature retrospectively compared the efficacy of two different NFPLA. New techniques to minimize postoperative scarring are in continual development. We recommend that all aesthetic surgeons, such as maxilla-facial surgeons, general plastic surgeons, and head/neck surgeons become familiar with at least one of these newer NFPLA techniques to achieve consistent and reliably good results.

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