



Review Article

Advancements in lip augmentation: A scoping review exploring novel techniques

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ABSTRACT

Lip augmentation is among the most popular cosmetic procedures done today. Advancements in trustworthy techniques have made it feasible to alter the visual characteristics of the lips through the utilization of various injectable substances and surgical procedures. However, there is a lack of standardization in these techniques. The purpose of this review is to focus on novel dermal filler injection and surgical techniques for lip augmentation. We did a scoping review of the literature using PubMed, Embase, and the Google Scholar database to identify all original articles published up to June 2023, assessing new techniques that focus on lip augmentation. In our review, only two studies out of seven included studies were surgical whereas the other five studies were non-surgical. This suggests that injection of dermal fillers is currently the most opted technique performed. This review suggests that incorporating perioral rejuvenation into the plan for lower facial surgery can help to complete the youthful look sought by patients. Injectable fillers provide excellent but short-term benefits and additional options such as Modified upper lip lift and French kiss techniques exist that offer the patient permanent improvements at a low cost.

Keywords: Lip, Injectable fillers, Rejuvenation

INTRODUCTION

In the past few decades, there has been a notable growth in the prevalence of cosmetic surgery worldwide, which can be attributed to an amplified societal focus on youthfulness and physical attractiveness. Lip augmentation is currently one of the most prevalent cosmetic operations since it is highly sought after for its visual appeal. The desire for full lips stems from its association with youthfulness and a sense of voluptuousness.¹

The esthetic appeal of an enlarged lip is not universally acknowledged, although contemporary social media platforms often promote and popularize attractive lip shapes and trends, hence fostering a widespread aspiration to achieve the idealized notion of a “perfect lip.” Advancements in trustworthy techniques have made it feasible to alter the visual characteristics of the lips through the utilization of various injectable substances and surgical procedures.^{1,2}

The cosmetic technique involves augmenting the size and contour of the lips with the utilization of fillers, including autologous fat, implants, or hyaluronic acids. Manufacturers of injectables have successfully created safe hyaluronic acid-based fillers for specific medical applications. In addition to the significance of filler quality and safety, lip enhancement operations necessitate a comprehensive understanding of the entire anatomy of the lips to mitigate the risk of vascular events.^{2,3}

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Several injectable strategies have been suggested lately for the administration of hyaluronic acid fillers. Sarnoff and Gotkin⁴ have outlined a six-step approach, whereas Sahan and Funda⁵ have documented a four-point injection technique utilizing a 27-gauge cannula, which has been identified as a secure and effective protocol for enhancing the appearance of the lips. Surek *et al.*⁶ have described a technique known as the “No-Touch” technique [Figure 1], wherein the mucosa is not breached during the process of infiltration. Nevertheless, the injection techniques lack uniformity.

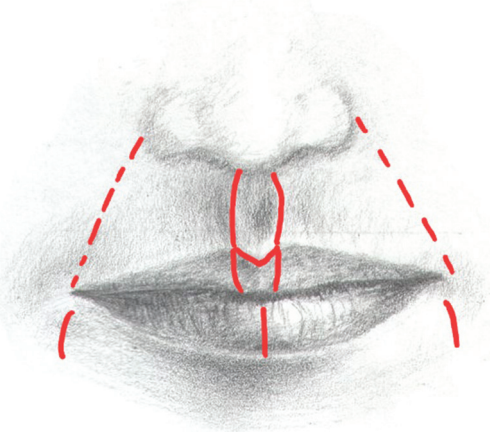


Figure 1: No touch technique.

The purpose of this review is to examine novel dermal filler injection and surgical procedures for lip augmentation that have been recently described in the literature, as opposed to the commonly employed approaches.

MATERIAL AND METHODS

Literature search

We did a scoping review of the literature available from the past decade using PubMed, Embase, and the Google Scholar database to identify all original articles published from January 2013 to June 2023, assessing new techniques that focus on lip augmentation.

Study selection criteria

The following inclusion criteria were used to select potential articles from the published abstract after the 2018 search results: (1) At least 10 human patients; (2) lips without pathology or patients without pathology that could be ameliorated by lip enhancement; (3) lip augmentation techniques should be thoroughly described; and (4) quantitative efficacy outcomes or complications must have been reported.

RESULTS

Our initial search results encountered 105 articles. Following the screening of the title and abstract, 40 articles were excluded out of which ten were duplicates and 30 articles due to the non-relevant theme of their study. Another 24 articles were excluded during full-text screening due to their study design.

We found 30 articles related to our search objectives. Out of 30 articles, 16 studies (7-surgical⁷⁻¹³ and 9-Non surgical^{5,6,14-20}) fulfilled our eligibility criteria [Tables 1 and 2]. The included studies are highlighted in table 1 and 2.

Other articles that were excluded are Goel K and Rai K's (2022)²¹ case report on the Retrograde linear thread technique for injection of dermal filler using a minimalist approach; the case report by Cymrot N (2022)²² on “Light Lips” Technique for dermal filler injection which included injection at 6 points i.e. right and left commissures, with the aim of elevating them, G and K points (Glogau-Klein) of the cupid's bow and its equivalent points on the lower lip and: Carlos G. Wambier²³ case report on “lip peel technique” performed with phenol-croton oil chemical peel. The aforementioned articles were excluded due to a lack of reporting quantitative efficacy outcomes. Shohreh Ghasemi, and Zahra Akbari²⁴ Russian lip filler technique, which include injection of filler vertically, concentrating on the middle of the lips, causing heightening the lip by focusing on the center, resulting in a heart-shaped appearance. This technique was excluded due to the communication design of the article and lack of information on desired outcomes.

Methodological approach to facial esthetic treatment with injectable hyaluronic acid fillers

Recently, Mauricio de Maio published the medical codes (MD)TM to provide uniform guidelines for facial filler injections. The MD codes divide the face into units and subunits and suggest an algorithm for the dose, delivery system, depth of injection, technique, and also alerts about the danger zones in these areas. The clear and standardized instruction of the MD Codes on how HA fillers should be injected may help novice clinicians reduce variability in their results to achieve successful outcomes and patient satisfaction, and may optimize success rates in experienced clinicians [Table 3].²⁵

DISCUSSION

The prominence of lip volume is a crucial factor in determining the appeal and esthetic qualities of persons. Nevertheless, the excessive plumpness of the lips results in a lack of facial proportion and adversely affects esthetics, while also impeding the functionality of the lips, such as speaking and eating. Hence, the outcomes of cosmetic procedures must be harmoniously matched to establish

Table 1: Filler techniques

Authors	Product used	Technique	Protocol	Outcome
Ali Sahan and Funda Tamer	Hyaluronic acid (Juvéderm Ultra 4)	Four-point injection technique	The lips were divided equally into the right side and left side. Four entry points were made above the vermilion border of the upper lip and below the vermilion border for the lower lip. The filler was administered with a fanning technique through each entry point.	50 female patients underwent a nonsurgical lip augmentation procedure with injectable fillers using this technique. 90% reported that they were satisfied or extremely satisfied with their lip enhancement procedure. No serious complications were observed.
Stéphane S, Candice SM, Florence B.	HA Stylage Lips (0,5 ml, Vivacy® Laboratories)	Bi-Bi" technique	A bi-plan approach, which involves both intramuscular and dermal injections as well as bi-devices (cannula and needle) using two hyaluronic acid fillers.	No side effects were observed except for standard post-treatment bruises and edema. No vascular incident occurred. Moreover, overall patient satisfaction was high (2.6/3) and there was a long-lasting perception of the effect of the filler.
Keramidas E, Rodopoulou S, GavalaMI	1–1.5 ml of hyaluronic acid (HA)	Step-by-Step * (Phi) Technique	Inject not more than 1.5 ml of filler in 1 session (hence “step-by-step”) and “phi” because they apply the golden ratio 1.618—broadly known as φ—to identify the proper points for injection.	The authors performed the technique on 833 patients. The majority of patients required 3 sessions to achieve the optimum result spaced in 1-month interval. The time until the desired result was achieved ranged between 1 and 16 months. In terms of the adverse effects, minimal pain, mild swelling, and a fair degree of redness were observed. Severe bruising was observed in 8 patients, mild bruising in 15 patients, and all developed bruising in the upper lip. Severe swelling occurred in 10 patients and mild swelling in 50 patients. However, no severe complications such as infection, vascular occlusion, necrosis, discoloration, or granuloma formation occurred. Regarding the duration of the results, the authors experienced that, after using 3 syringes of 1 ml, the desired results can be long-lasting.
Trévidic, P, & Criollo-Lamilla, G	Hyaluronic acid filler formulated with lidocaine (RHA 2 Teoxane, Geneva, Switzerland)	French Kiss Technique	Enhance the length of the lips by everting the vermilion.	The Initial results were promising with 90% of subjects rating their appearance as “improved” or “much/very much improved” after treatment. No major complications were reported, and 90% of patients rated their pain intensity as low.
Dario B et al.	Vycross range (Allergan, Dublin, Ireland), the products used had intermediate G'	The Lip Omni comprehensive Volume Enhancement (LOVE) approach	The technique is performed in 3 modules. Lip shape: This module was based entirely on VYC-17.5 Two 0.2 mL boluses were injected using a 30G needle into the lip to support the corners of the mouth.	Mean patient satisfaction at 4 weeks [on a seven-point scale from 0 (extremely dissatisfied) to 6 (extremely satisfied)] was 4.8–4.9 in each age group.

(Contd...)

Table 1: (Continued)

Authors	Product used	Technique	Protocol	Outcome
	(17.5 mg/mL HA; VYC-17.5; Volift) or very low G ⁺ (12 mg/mL HA; VYC-12; Volite).		<p>The entire vermilion border was then treated using a retrograde linear technique with a 30G needle. The philtral column was also injected in a retrograde fashion. This used a bolus of about 0.05 mL injected using a 30G needle at the nasal-labial angle area (anterior nasal spine) at the two ends of the philtrum (ie, columella and vermilion). The needle was gradually retracted, injecting smaller quantities towards the apex of the philtrum, where another mini-bolus was injected to give a concave appearance and create upper lip out-rotation.</p> <p>Lip volume: This module used VYC-17.5. Four points were injected in the upper lip and four in the lower lip using a 38 mm 25G cannula or a 30G needle. A bolus technique was used and the product was placed in the body of the lip over the orbicularis muscle. A greater amount was placed in the central area near the lip tubercles and less was placed laterally. The typical volume was 0.1 mL per point but this could be varied based on individual anatomy.</p> <p>Lip hydration: This module uses VYC-12, which has a very low G⁺ and hence is extremely soft, allowing for superficial (submucosal) placement without a significant risk of creating product lumps. Bolus injections of 0.1–0.15 mL were made in the upper lip and three on the lower lip. All used a 38 mm 25G cannula</p>	53 patients (88%) experienced edema and 10 (17%) had bruising. These were all minor and transient and resolved spontaneously. One patient (2%) presented with lumps.
Adel N	hyaluronic acid filler (Belotero Volume, Merz Company)	Lip Filler Injection using an Inverted Mercedes Benz Sign	<p>Three entry points were chosen for the whole injection procedure resembling an inverted triangle or an inverted Mercedes Benz sign, the upper lip was injected through two entry points that were chosen at each Glogau-Klein (GK) point (the ski slope shape of the lip in the profile as you move from the skin above the lip down onto the pink vermilion).</p>	Of the total 10 patients treated, 80% reported mild pain at the time of anesthesia injection especially at the subnasale point, with complete comfort after the anesthetic effect started before performing the filler injection.

(Contd...)

Table 1: (Continued)

Authors	Product used	Technique	Protocol	Outcome
Solomon P, Ng CL, Kerzner J, Rival R	20% 3 rd generation PMMA microspheres suspended in 80% bovine collagen gel and 0.3% lidocaine (Bellafill, Suneva Medical Inc, injectable)	-	The lower lip, on the other hand, was injected through one entry point right at the midline. Filler injection for the upper lip was performed in the following fashion: a pilot needle was used to create an opening right at the tip of cupid's bow (GK point) on the right side of the upper lip. After creating the opening, a 1 microcannula (22 G 50 mm) was used to enter through the opening in a vertical fashion until it reached slightly behind the wet/dry border.	In total, 20% reported comfort throughout the entire procedure. Some degree of erythema, edema, and bruising was observed in 70% of the patients, at the point of entry at the GK point in the upper lip, where it would be visible on only one side of the lip (the left side or the right side). There were no cases of vascular occlusion or any adverse events. no cases of filler spread into the ergotrid area, creating a mustache appearance. At the end of the study, 100% of the patients reported a high degree of satisfaction.
Hamid O, Quinlan DJ, Seemann R,	platelet-rich fibrin	-	The filler was injected in small tunnels in the deep dermis, or in a fanning configuration.	90.9% patients satisfied with the improvement.
Hamid O, Quinlan DJ, Seemann R,	injectable platelet-rich fibrin	-	intra-dermal injection of i-PRF+ in the upper and lower lips (5 ml in each quadrant, total ~2 ml)	FACE-Q ²⁶ scales that measure satisfaction with skin and lip showed a statistically significant improvement from baseline ($p=0.04$ and $P=0.02$, respectively). Satisfaction with lip lines showed a numerical improvement with mean total scores for adverse effect scales related to the skin and lips reduced at 2 weeks post-procedure ($p=0.03$ and $P=0.13$, respectively). Overall lip volume at 3-month follow-up was unchanged ($p=0.11$).
Surek, C. C et al.	hyaluronic acid (Restylane; Galderma, Uppsala, Sweden)	No touch technique	The no-touch technique refers to the concept that the mucosa is never violated during infiltration. In all three facets of this method, the needle or cannula is inserted on the outside of the white line. Lip profile is determined by the position of the white roll. The white roll is accessed by a 30-gauge needle at a point 5 mm lateral to the oral commissure and at the base of the philtral columns. Lip projection is established by vermilion formation contributing to the arc of the Cupid's bow.	Potential adverse reactions are minimal and are mainly injection-related and self-resolving. Common issues on injection include pain, swelling, erythema, discoloration, tenderness, and temporary palpable nodules at the injection site

(Contd...)

Table 1: (Continued)

Authors	Product used	Technique	Protocol	Outcome
			To improve projection, the labial commissure is entered with a 25-gauge cannula and tunneled into the submucosal space between the white and red rolls. Lip augmentation is a direct reflection of the prominence of the red line and can be approached in a perpendicular fashion with a needle or cannula descending to the level of the wet-dry junction.	

RHA: Resilient hyaluronic acid, VYC: Juvederm Volift, PMMA: Polymethyl methacrylate

Table 2: Surgical techniques






Talei <i>et al.</i>	823	Modified subnasal lift	Subnasal bull's horn excision with fascial suspension	3–36	There were no patients demonstrating any limitation in movement or smile. Five patients required revision. Two patients developed dermal atrophy and telangiectasias. Two patients had prolonged edema extending to the 4-month mark, Ten patients developed a rash from antibiotic ointment. Two patients complained of vague changes in character of the nostrils. Two patients experienced minor hematomas. Two patients presented with a 1-mm rim of eschar/epidermolysis of unknown cause around the lateral nostril base that healed without incidence.
Tonnard <i>et al.</i>	500	Subnasal lift	Subnasal bull's horn excision followed by microfat grafting in 396/500 patients	3-39	An unaesthetic stretched scar widening leading to scar revision occurred in two cases (0.5%). Five patients (1%) asymmetry of the augmented lip ($n=3$) or nasolabial fold ($n=2$). Bruising and moderate swelling were seen in all patients and resolved within the normal postoperative period. All patients experienced a temporary loss of sensation at the nostril margin until approximately 4 months postoperatively.
Jung <i>et al.</i>	30	Subnasal short scar lift	Two subnasal incisions, sparing the philtral columns and groove	12	All patients expressed a high degree of satisfaction. The average ratio between the L1 reference line and the height of the upper lip measurement preoperatively was 0.43 ± 0.05 . This ratio was improved postoperatively to an average of 0.32 ± 0.05 . The nasolabial angle was 91.31 ± 4.19 degrees before surgery and 105.62 ± 5.04 degrees after surgery. The angle of the upper lip was 48.97 ± 2.41 degrees before surgery and 38.21 ± 3.34 degrees after surgery.

(Contd...)

Table 2: (Continued)

Pan	84	Subnasal lift with orbicularis oris resection	Subnasal bull's horn excision with "T" shaped muscle resection	24	Significant efficiency was achieved and high satisfaction, satisfaction, and dissatisfaction ratings were reported by 55 (72.4%), 18 (23.7%), and 3 (3.9%) patients, respectively.
Lee et al.	202	Subnasal lift	Subnasal bull's horn excision	2-59	The vertical disproportion of the lower face was improved after the treatment, and there was significant shortening of the philtrum length ($P<0.001$) and an increase in a visible upper vermilion ($P<0.001$).
Raphael et al.	311	Endonasal lift	Subnasal wavy ellipse with advancement flaps	12-120	Infection and/or wound dehiscence 2.8%.
Barati B, Asadi M, Jahanshahi F	10	Autogenous filler - Post-Auricular Fibroareolar Tissue	Loose fibroareolar tissue was harvested from the post-auricular region and was inserted in the prepared lip pocket.	6	Average upper and lower lip height increased from 5.27 to 8.72 mm ($p<0.001$).

Table 3: MD codes components

Component	Meaning
Letter	The anatomical area (e.g., Ck=cheek)
Number	The subunits of the anatomical unit (e.g., Ck1=zygomatic arch; Ck2=zygomatic eminence)
Number location	The side of the face (e.g., Ck1 r=the zygomatic arch on the right side; Ck1 l=the zygomatic arch on the left side)
Number position	Superscript (Xn) refers to upper areas (e.g., Lp1=vermilion body of the upper lip) Subscript (Xn) refers to lower areas (e.g., Lp1=vermilion body of the lower lip)
Color	Red color denotes alert areas, and additional caution must be taken if injecting at or near these sites, for patient safety
Shape	Technical delivery of the product (e.g., =  needle, =  cannula, =  fanning, =  aliquots; =  bolus)

MD: Medical codes

proportional relationships among the various components of the face.^{1,2}

The objective of lip augmentation surgery is to achieve lips that are characterized by a well-defined vermilion border, sufficient volume, and a smooth appearance. There exists a lack of a singular method to get the desired outcomes. Nevertheless, a comprehensive understanding of anatomy and the utilization of suitable goods and methodologies are imperative in achieving a genuine and authentic esthetic outcome.^{3,4}

Lip augmentation methods can be categorized into two main types: Surgical and noninvasive interventions. In our study, it was observed that just two out of the seven included studies focused on surgical interventions, while the remaining five studies examined non-surgical approaches.

The surgical techniques of esthetic upper lip enhancement have evolved significantly over the years. Overall, the included studies reported improvement in the esthetic appearance of the upper lip after surgical enhancement, along with few but promising reports of high patient satisfaction. However, there is a relative paucity of high-quality data regarding

complication profiles. Analyses on patient selection, indications, and contraindications about each technique are lacking. As with most facial esthetic procedures, for upper cheiloplasty, a non-esthetically appealing final scar or adverse scarring is a major concern for patients and surgeons. Various studies have shown the rates of adverse scarring to be 1–5%. Our review found the incidence of these complications to be higher. The lip advancement techniques are associated with the lowest rate of adverse scarring (3.2%), whereas the subnasal lift techniques have higher rates of adverse scarring (6.7–10.5%). Given the lack of standardization of technique and approach among the studies, these rates might be falsely elevated.²¹⁻²⁸

The administration of dermal fillers is presently the most commonly chosen method utilized to augment lip volume and enhance lip contour.

Dermal fillers are categorized as follows: Permanent fillers, that is, silicone, polymethylmethacrylate, *Polyacrylamide*, and short-term fillers, that is, collagen, hyaluronic acid, and calcium hydroxyapatite. Various authors suggested a

combination of fillers with varying injection depths and techniques to obtain successful results.³

Bovine collagen, however, shows a lesser degree of allergic reactions, up to 2%, which necessitates a pre-patch test before the procedure, and 5% of the disproportionate distribution and nodule formation of the bovine collagen resulting in the unesthetic appearance postoperatively., fat volume loss is one of the contributing factors to the aging process.²⁷ Fat grafts can be used to rejuvenate lip areas. However, fat compartments resorb eventually, disproportionately creating an unesthetic appearance. Platelet-rich products are viable and economic alternatives for lip augmentation; however, trials showed their shorter duration of longevity. Its usage in conjunction with fat grafts, provides better results in terms of longevity.²⁸

Hyaluronic acid fillers are widely employed in the field of esthetic medicine for lip augmentation.³ At present, no superiority of hyaluronic acid filler products over others has been shown. Trials have been plagued by poor methodological quality, conflicts of interest, and industry sponsoring. A recent trial compared 4 hyaluronic acid dermal filler brands, that is, Juvéderm Ultra 3, Belotero Intense, Restylane Kysse, or Stylage M. Authors found that the absolute difference in lip volume increase from baseline to follow-up between Juvéderm versus Stylage was 1.6 mm (15.4%) in their sample of women with relatively small lips (an average of 10.9 mm at baseline), suggesting a clinically relevant longer duration of Stylage. The absolute difference in the lip appraisal score increase between Juvéderm versus Belotero was 20.9%, suggesting a clinically relevant better appraisal of Juvéderm over time. The authors concluded that statistically significant but clinically arguably relevant superiority was found in duration, patient satisfaction, and quality of life. No product was superior in all categories. Safety profiles were equal.²⁹

Numerous injection strategies have been documented in the literature with regard to lip augmentation including four

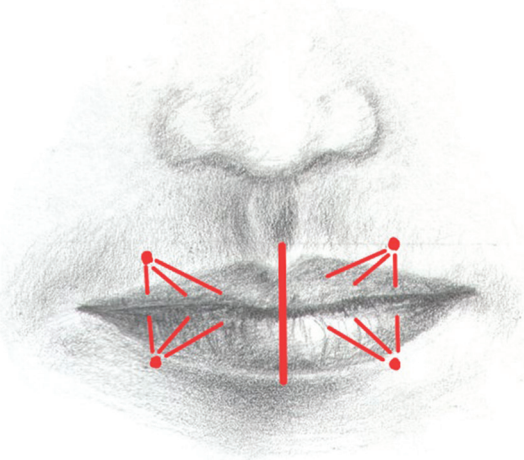


Figure 2: Four point injection technique.

point injection technique, bi-plan approach using bi-devices (cannula and needle), Step-by-Step Φ (Phi) Technique, Trévidic, French kiss technique, Inverted Mercedes Benz Sign.^{5,6,14-20} Each author has meticulously performed and justified their techniques.

Sahan and Funda⁵ suggested four point injection technique [Figure 2], Stéphane *et al.*¹⁴ suggested a bi-plan approach using bi-devices (cannula and needle), Keramidas *et al.*¹⁵ Step-by-Step Φ (Phi) Technique, Trévidic, and Criollo-Lamilla,¹⁶ suggested French kiss technique, Adel¹⁸ suggested lip Filler Injection using an Inverted Mercedes Benz Sign [Figure 3]. Each author has meticulously performed and justified their techniques.

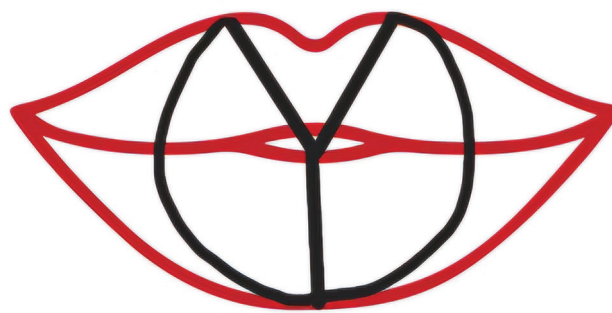


Figure 3: Injection using Inverted Mercedes Benz Sign.

Mild erythema represents the prevailing post-operative complication frequently observed in conjunction with filler procedures. This particular complication is characterized by its temporary nature, gradually diminishing over a specified duration. The most prevalent consequence related to surgical methods is scarring and moderate paresthesia, which are observed in contrasting cases.

To enhance the existing body of knowledge about this subject, it is recommended that the next studies prioritize the comparison of surgical interventions with non-surgical fillers.

In addition, the research should be conducted prospectively if feasible, as this approach helps to mitigate potential reviewers and recall biases. Subsequently, it is imperative to engage in a comprehensive analysis of projected quantitative outcomes to enhance the audience's understanding of the specific drawbacks and benefits associated with a given operation or surgical alternative.

However, it is important to note that the majority of the studies we analyzed and evaluated have a low level of evidence for their reported effects. These articles employed innovative methodologies for the 1st time, with a greater emphasis on the technical aspects rather than a comprehensive quantitative analysis of the study's outcomes, complexities, or statistical properties. There is a need for further comparison studies to enhance comprehension of the variations in effectiveness

and problems associated with the various procedures and selection of dermal fillers.

CONCLUSION

The aging of the lower face is attributed to the perioral complex, and failure to adequately address this region results in an inadequate rejuvenation of the lower face. The integration of perioral rejuvenation within the comprehensive strategy for lower face surgery can effectively contribute to the achievement of the desired youthful esthetic appearance among patients. Injectable fillers give notable though temporary advantages, while alternative approaches such as Modified upper lip lift and French kiss procedures present patients with enduring enhancements at a relatively affordable expense. To continuously achieve optimal outcomes in the lower face and cost-effectively enhance overall happiness, surgeons must possess a comprehensive comprehension and proficiency in various approaches to volume restoration, lip proportion enhancements, and the treatment of aging skin.

Authors' contributions

Conceptualization, Sanika Tanawde: methodology, Rushika Jain. and Sanika Tanawde: validation, Sanjay Joshi: formal analysis, Aarti Garad, Deepti Chablani and Charudatta Naik resources, data curation, writing, original draft preparation, Sanika Tanawde and writing, review and editing, Sanika Tanawde, Rushika Jain, Deepti Chablani: supervision, Sanjay Joshi, Aarti Garad, Charudatta Naik. All authors have accepted responsibility, read and agreed to the published version of the manuscript.

Ethical approval

Institutional Review Board approval is not required.

Declaration of patient consent

Patient's consent was not required as there are no patients in this study.

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Conflicts of interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The authors confirm that there was no use of artificial intelligence (AI)-assisted technology for assisting in the

writing or editing of the manuscript and no images were manipulated using AI.

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