

Long-term Analysis of Lip Augmentation With Superficial Musculoaponeurotic System (SMAS) Tissue Transfer Following Biplanar Extended SMAS Rhytidectomy

Matthew Allen Richardson, MD; Daniel Elliott Rouso, MD; William H. Replogle, PhD

IMPORTANCE To our knowledge, long-term, objective results of lip augmentation using superficial musculoaponeurotic system (SMAS) tissue transfer beyond 1 year have not been previously described.

OBJECTIVE To evaluate the efficacy, longevity, and safety of lip augmentation using SMAS tissue transfer.

DESIGN, SETTING, AND PARTICIPANTS A retrospective single-blind cohort study was designed to evaluate all patients who underwent surgical lip augmentation using SMAS following rhytidectomy between January 1, 2000, and November 16, 2015, at a private facial plastic surgery practice in Birmingham, Alabama. Preoperative photographs of each patient served as controls and were compared with postoperative photographs at 3 months, 1 year, and 5 years after lip augmentation. A total of 104 images (from 26 individual patients) were reviewed by 12 blinded observers using a validated lip augmentation grading scale.

EXPOSURES Lip augmentation using SMAS.

MAIN OUTCOMES AND MEASURES Median lip volumes of all patients at each postoperative interval (3 months, 1 year, and 5 years) compared with preoperative lip volumes. Secondary outcome measures included postoperative complications.

RESULTS A total of 423 patients were identified who underwent surgical lip augmentation using SMAS. Sixty patients with approximately 5 years or more of postoperative photographs were reviewed for complications. Twenty-six patients had 3-month, 1-year, and 5-year postoperative follow-up photographs and were included in the photographic evaluation. The mean age of these patients at the time of surgery was 54.6 years (range, 41.2-80.6 years). Fifty-nine of the 60 patients (98.3%) were female. Two of 60 patients (3.3%) with 5 years or more of postoperative follow-up developed complications requiring intervention. Both the superior lip and the inferior lip showed statistically significant increases in volume at 3 months, 1 year, and 5 years ($P \leq .004$ for the superior lip after 5 years; $P \leq .001$ for all other comparisons) after SMAS lip augmentation. The greatest median increase was observed in the superior lip at 3 months, while the smallest median increase was observed for the inferior lip at 5 years. The degree of increase in median volume seemed to weaken slightly over time, but remained statistically significant even at 5 years.

CONCLUSIONS AND RELEVANCE SMAS lip augmentation is an effective and safe method for lip augmentation that can yield natural, long-lasting results with minimal risk. The degree of augmentation tends to fade slightly over time, but remains significant for at least 5 years postoperatively.

LEVEL OF EVIDENCE 3.

Author Affiliations: Rouso Facial Plastic Surgery Clinic, Mountain Brook, Alabama (Richardson, Rouso); Department of Family Medicine, University of Mississippi Medical Center, Jackson (Replogle).

Corresponding Author: Matthew Allen Richardson, MD, Rouso Facial Plastic Surgery Clinic, 2700 Hwy 280, Ste 300W, Mountain Brook, AL 35223 (texasfacialaesthetics@gmail.com).

Confidential. Do not distribute. Pre-embargo material.

Lip augmentation is an extremely popular cosmetic procedure, and numerous materials and techniques are available to both surgeons and nonsurgeons to improve the definition and fullness of the lips. Full lips with strong definition are often a key feature of a youthful facial appearance.¹ Nonsurgical options for lip augmentation include both temporary and permanent injectable fillers.² While temporary fillers are extremely popular, readily available, and relatively noninvasive, they are not without risks, including bruising, swelling, asymmetry, product migration, nodule formation, undercorrection, overcorrection, allergic reaction, and potentially even vascular compromise with necrosis.³ Even if the results are aesthetically pleasing and without complications, the result is temporary. Permanent fillers have all of the same risks, but with the risk of permanent rather than temporary undesirable changes.²

Numerous surgical techniques for lip augmentation without the addition of any autologous or synthetic material have been described, including mucosal advancement techniques, subnasal lip-lifts, and vermilion advancement techniques.^{1,2,4-6} Various materials have also been successfully implanted into the lips through percutaneous techniques, including expanded polytetrafluoroethylene, acellular dermis, silicone, autologous fat, fascia, and others.^{1,2,7-10}

Several studies have described the use of superficial musculoaponeurotic system (SMAS) tissue transfer for augmentation of the perioral area, nasolabial folds, and lips.^{1,9,11-13} Very few studies have specifically addressed lip augmentation with SMAS, and to our knowledge, long-term, objective results of lip augmentation using SMAS tissue transfer beyond 1 year have not been previously described. The use of SMAS for lip augmentation has several advantages, including the lack of allergic reactivity, the minimal increase in cost (operating room time), and the fact that the SMAS is usually readily available during rhytidectomy. We have also observed that lip augmentation with SMAS is an extremely long-lasting result. The objective of this study was to evaluate the efficacy, longevity, and long-term safety of lip augmentation using SMAS tissue transfer following biplanar extended SMAS rhytidectomy.

Methods

Surgical Procedure

To obtain SMAS tissue for lip augmentation, a standard biplanar rhytidectomy is performed. The typical rhytidectomy skin incision is created, and subcutaneous undermining is carried into the neck for full access to the SMAS tissue overlying the parotid fascia. The SMAS tissue is grasped with forceps, tented up off the underlying parotid fascia, and trimmed sharply using face-lift scissors in a superior to inferior direction. The SMAS excision starts at the level of the helical root and is carried inferiorly, being careful to avoid violating the parotid fascia. The SMAS excision is continued just anterior and inferior to the lobe and concludes with excising the SMAS off the superficial aspect of the sternocleidomastoid muscle. This technique allows the SMAS to be excised in a single long strip that can then

Key Points

Question Does lip augmentation with superficial musculoaponeurotic system (SMAS) tissue provide long-lasting results with minimal risk for complications?

Findings In this cohort study, both the superior lip and the inferior lip showed statistically significant increases in volume at 3 months, 1 year, and 5 years after SMAS lip augmentation. Two of 60 patients (3.3%) with 5 years or more of postoperative follow-up developed complications requiring intervention.

Meaning SMAS lip augmentation is an effective and safe method for lip augmentation that can yield natural, long-lasting results with minimal risk.

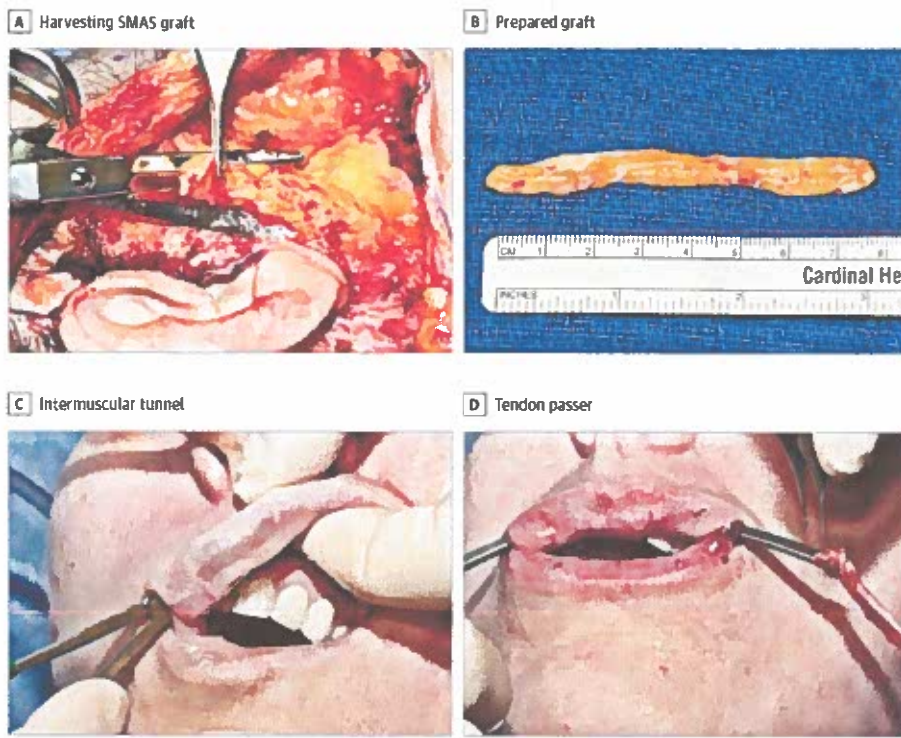
be tailored for lip augmentation. The SMAS tissue is then stored in saline solution while the SMAS imbrication and remainder of the rhytidectomy are performed.

Once the rhytidectomy is complete, attention is shifted to preparing the SMAS for implantation into the lips. The long, continuous piece of SMAS is trimmed to size depending on the length of the lips and the degree of augmentation desired by the patient. The SMAS is trimmed of excess tissue so that it is smooth and without any significant nodularity. The SMAS tissue is trimmed so that it is slightly shorter than the length of the patient's lips (distance between the oral commissures). In general, 1 strip of SMAS from a single cheek area is long enough to augment either the superior or inferior lip, but not both. The second strip of SMAS that is excised from the contralateral cheek will be required to augment the second lip. A typical SMAS graft will vary in size from approximately 6 to 9 cm in length and 1 to 1.5 cm in width.

Prior to the lip augmentation, both lips are infiltrated with 2% lidocaine with 1:100 000 epinephrine. Care is taken not to distort the lips with excess infiltration of local anesthetic. After allowing for vasoconstriction, stab incisions are then made at the mucosal aspect of each oral commissure using a No. 15 blade. A fine hemostat is then used to create an intramuscular tunnel across each lip from the oral commissure incision to just beyond the midline of the lip with small spreading motions. This procedure is repeated from the contralateral oral commissure incision for each lip. The surgeon must be careful not to spread the hemostat too widely during the dissection to avoid tearing the oral commissure incision. This could result in noticeable scarring that extends onto the skin lateral to the oral commissure. A curved tendon forceps (Anthony Products Inc) is then passed through the intramuscular tunnel from one oral commissure to the other with the instrument closed, then withdrawn with the instrument slightly open to ensure that the intramuscular tunnel across the lip is complete and wide enough to accommodate the SMAS graft. Once the intramuscular tunnel is deemed to be of adequate size, the curved tendon forceps are placed into the oral commissure incision, through the intramuscular lip tunnel, and out the opposing oral commissure incision on the contralateral side. The tailored SMAS graft is then grasped with the tendon forceps and pulled into the intramuscular tunnel. Once the graft is in place and released by the forceps, gentle manual retraction of

Confidential. Do not distribute. Pre-embargo material.

Figure 1. Surgical Technique



A, Harvesting the superficial musculoaponeurotic system (SMAS) graft from the preauricular area during rhytidectomy. B, SMAS graft prepared for implantation. C, Creating the intramuscular tunnel across the lip using a fine hemostat. D, Passing the curved tendon passer through the lip to grasp the SMAS.

the lip away from the teeth in the midline will tend to pull the SMAS graft into the central portion of the lip and away from the incisions. Palpation of the lip will allow for slight manipulation of the graft as needed. Any excess graft that extends into or beyond the oral commissure incisions can then be carefully trimmed and excised. The procedure is repeated for the second lip, and the oral commissure incisions are then closed with 2 interrupted 5-0 plain gut sutures on each side. The surgeon should ensure that the SMAS graft is not caught by the sutures while closing the oral commissure incisions because this could potentially tether the graft and cause asymmetry or restrict the movement of the lip. Some of the techniques described above are shown in Figure 1.

Postoperative Care

Postoperatively, patients are again counseled that the lips will be swollen, stiff, and more full than they desire for the first several weeks. The sutures at each oral commissure are left long because patients will tend to manipulate them with the tongue, and the sutures may subsequently unravel. We also counsel patients that the incision at the oral commissure may be palpable initially but will disappear as the edema resolves throughout the first several weeks postoperatively. No special care is otherwise required for the lip augmentation, and routine post-rhytidectomy care is initiated. Routine postoperative medications include broad-spectrum oral antibiotics, a short course of oral corticosteroids, acyclovir (for patients with surgery to the lips or any skin resurfacing), and as-needed pain medications, antiemetics, and sleeping aids.

Study Design

A retrospective, single-blind cohort study was designed to evaluate all patients who underwent surgical lip augmentation using SMAS tissue following biplanar extended SMAS rhytidectomy at a private facial plastic surgery practice between January 1, 2000, and November 16, 2015. The study was performed at the Rouso Facial Plastic Surgery Clinic, a private facial plastic surgery practice located in Birmingham, Alabama.

Patients were then excluded if they lacked adequate photographic documentation for each of the 3 required time intervals or if they underwent any further lip augmentation during the postoperative follow-up period. If patients did not have adequate photographs at all 4 intervals (preoperatively, 3 months postoperatively, 1 year postoperatively, and 5 years postoperatively), they were excluded from the study. This required exclusion of patients who had follow-up beyond 5 years, but no follow-up photographs within 3 years after their 5-year postoperative date. All patients had signed an informed consent document allowing the use of their photographs for research purposes. Patients were not contacted specifically for the study because it was retrospective in nature. The general tenets of the Declaration of Helsinki¹⁴ were followed for this retrospective study, and there was no patient contact or involvement with the study. All information and photographs were deidentified.

Photonumeric Grading

Preoperative and postoperative photographs were obtained for all patients. These photographs were graded by 12 blinded

Confidential. Do not distribute. Pre-embargo material.

Figure 2. Patient Photographs



A, Preoperative photograph.
B, Five-year postoperative photograph of the same patient.

observers using a validated lip augmentation grading scale for the superior lip and inferior lip independently. Participants were not compensated for the study. The validated photonumeric grading scale of lip volume and thickness was described by Rossi et al¹⁵ in 2011. Deidentified preoperative photographs of each patient served as controls and were compared with postoperative photographs at 3 months, 1 year, and 5 years after surgical lip augmentation, for a total of 4 photographs per patient. Photographs were not altered in any way except to crop the images to the standard deidentified view focusing on the perioral area, as seen in Figure 2.

All 12 observers were blinded to the intent of the study and to the time frame of each photograph. The observers were asked to simply grade the superior and inferior lip independently using the 9-level lip grading scale by Rossi et al.¹⁵ This scale is scored from grade 1 (very thin) to grade 5 (very full) in 0.5-point increments.

All patient images were viewed on the same digital monitor by each observer. On an adjacent digital monitor, the observers were provided a digital copy of the 9-level grading scale by Rossi et al¹⁵ to use as a reference and comparison tool while viewing and grading the patient images. The patient photographs were presented in a random fashion after being randomized by a random number generator. Twenty-six patients were presented with 4 images per patient, for a total of 104 images viewed by each observer. A score was recorded for the superior and inferior lip in each image. The order was consistent and unaltered for each observer.

The primary outcome measures were the median lip fullness scores of all patients at each postoperative interval (3 months, 1 year, and 5 years) compared with median preoperative lip fullness scores as graded by 12 blinded observers. Secondary outcome measures included postoperative complications related to SMAS lip augmentation.

Statistical Analysis

The results of the scoring performed by the 12 blinded observers using the photonumeric grading scale were used to derive a median observer score for both the superior and inferior lip for each of the 26 patients for each of the 4 measurement periods: preoperative, 3-month postoperative, 1-year postoperative, and 5-year postoperative. For the superior and inferior lips separately, we simultaneously tested for differences in ratings among the 4 time periods using Friedman rank test for correlated samples. If significance among

the time periods was found, pairwise comparisons of the 4 time periods were performed with a Bonferroni correction for multiple comparisons. $\alpha = .05$ was used to determine statistical significance. SPSS statistical software, version 23, was used.

Results

A total of 423 patients were initially identified who underwent lip augmentation using SMAS between January 1, 2000, and November 16, 2015. Sixty of these patients were identified as having approximately 5 years or more of postoperative follow-up, including photographs. All 60 of these patients underwent a retrospective medical record review to identify any complications associated with SMAS lip augmentation. The mean age of these patients at the time of surgery was 54.6 years (range, 41.2-80.6 years). Fifty-nine of the 60 patients (98.3%) were female. The mean follow-up duration for these 60 patients was 1882 days, with a maximum follow-up duration of 4976 days.

Two of 60 patients (3.3%) with 5 years or more of postoperative follow-up developed complications requiring intervention. One patient was found to have persistent edema at 2 weeks post-SMAS lip augmentation that required steroid injection and subsequently resolved. A second patient developed some nodularity of the lip 8 years postoperatively that required a minor surgical revision. A third patient was noted to have some mild asymmetry of the lips 8 years postoperatively but did not desire any intervention.

Of the 60 patients with at least 5 years of postoperative follow-up, 9 were excluded for having additional lip augmentation with fillers or additional surgical procedures. Twenty-five additional patients were then excluded for a lack of adequate photographs at either the 3-month, 1-year, or 5-year postoperative date. Twenty-six patients were eventually identified with 3-month, 1-year, and 5-year postoperative follow-up photographs and were included in the photographic evaluation. All of these 26 patients were female, with a mean age of 56.2 years. A total of 104 images (26 individual patients) were reviewed by 12 blinded observers, and graded for the superior lip and inferior lip independently.

Results of the Friedman test indicated significant differences in the ratings of both the superior and inferior lips ($P \leq .004$ for the superior lip after 5 years; $P \leq .001$ for all other

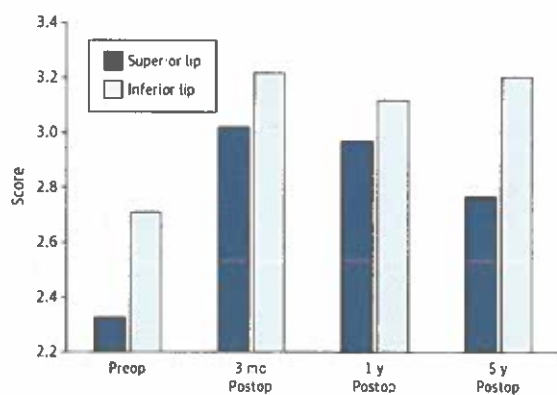
Confidential. Do not distribute. Pre-embargo material.

Table. Median Photonumeric Lip Fullness Scores

Time Interval	Superior Lip Score	Score Increase	P Value	Inferior Lip Score	Score Increase	P Value	Days From Surgery to Photos, Mean
Preop	2.33			2.71			-85.7
Postop							
3 mo	3.02	0.69	<.001	3.22	0.51	<.001	92.8
1 y	2.97	0.64	.001	3.12	0.41	<.001	395.4
5 y	2.77	0.44	.004	3.20	0.49	<.001	2011.6

Abbreviations: Postop, postoperative; preop, preoperative.

Figure 3. Median Lip Fullness Scores by Time Interval



Postop indicates postoperative; preop, preoperative.

comparisons) among the 4 time periods. For both the superior and inferior lips, pairwise comparisons indicated that each of the 3-month, 1-year and 5-year ratings were significantly greater than the preoperative ratings (Table). Separate pairwise comparisons of the superior and inferior lip ratings at 3 months, 1 year, and 5 years did not achieve statistical significance between these 3 time periods. Thus, both the superior lip and the inferior lip showed statistically significant increases in volume postoperatively at 3 months, 1 year, and 5 years ($P \leq .004$ for the superior lip after 5 years; $P \leq .001$ for all other comparisons) after SMAS lip augmentation. The greatest median increase was observed in the superior lip at 3 months (a 0.69-point increase), while the smallest median increase was observed for the inferior lip at 1 year (a 0.41-point increase). The degree of increase in median volume appeared to weaken slightly over time but remained statistically significant compared with the preoperative ratings and close to a 0.5-point increase in the grading scale even at 5 years for both the superior and inferior lip, respectively. There were no statistical differences in median volumes between the 3 postoperative time periods. These changes are represented in the Table and graphically in Figure 3.

Discussion

The use of SMAS tissue augmentation at the time of rhytidectomy is a simple and effective technique, particularly when applied to lip augmentation. This SMAS tissue would otherwise

be discarded and is much more cost-effective than purchasing commercial products to place in the lip for augmentation. The only additional costs involved are the minimal increase in operative time required to perform the procedure and a minimal amount of additional suture, which would also be required for most any lip augmentation technique except for transcutaneous fillers.

The complications associated with the SMAS lip augmentation technique described herein included postoperative lip edema, nodularity, and mild asymmetry at 8 years after surgery. These complications were all extremely mild and could occur with most lip augmentation techniques. Only 2 of these were significant enough that the patient even desired intervention. Regarding the persistent edema, we now routinely counsel patients that the lips will be edematous and more full than the patients desire for the first several weeks postoperatively, but that this should begin to subside after the first 2 weeks. We also counsel patients that the lips will feel abnormal and stiff for the first several weeks after surgery, but the mobility and sensation of the lips will return to normal, usually within 3 to 4 weeks after surgery. The lips will eventually return to their preoperative level of mobility and softness without the artificial appearance or feel of synthetic augmentation materials, but with close to the same amount of longevity.

Various lip fullness scales have been published and validated,¹⁵⁻¹⁷ but the Rossi et al¹⁵ scale provides clear examples of all 9 grades of superior and inferior lip fullness and allocates a numeric score from 1 to 5 in 0.5-point increments for each grade. This allows for simple statistical analysis of surgical change and for discussion of the amount of augmentation that a patient may expect with a given treatment (eg, a 0.5- or 1.0-point grade improvement).

The photonumeric grading scale data contributed by the blinded observers clearly demonstrates that the lip augmentation technique we describe with SMAS tissue is a significant change that is long-lasting. The median changes for the superior and inferior lips at 3 months postoperatively were an increase of 0.69 points and 0.51 points, respectively. This is slightly greater than 1 grade on the 9-level grading scale described by Rossi et al.¹⁵ We routinely counsel patients that SMAS augmentation to the lips will provide a moderate, long-lasting (essentially permanent) change to the lips but will not provide a dramatic change, even in the short term. By trimming the SMAS appropriately, this technique avoids the “overdone” or bizarre appearance of extremely full lips that many patients fear.

Confidential. Do not distribute. Pre-embargo material.

The patients did experience a very slight decrease in their fullness ratings as time passed postoperatively. Some of this could be secondary to atrophy or absorption of the SMAS over time, but this trend could also be attributed to the fact that this is long-term follow-up over the course of many years, and these patients are continuing to age with associated loss of collagen and lip fullness as part of the natural aging process.

Limitations of this study include its retrospective nature, limited percentage of patients with the required photographic documentation, and potential exclusion bias. The results of this study could be affected by the fact that patients who had any other filler or surgical treatment to their lips after SMAS augmentation were excluded. These excluded patients might have experienced less augmentation than patients that were analyzed in the study, but we felt that excluding these patients would provide a more accurate reflection of the true results of SMAS augmentation alone, rather than confusing the study results by including some patients with addi-

tional lip augmentation materials or techniques. Many of these patients probably also desired more lip augmentation than SMAS augmentation will typically achieve as they opted for additional augmentation postoperatively.

This analysis was designed to assess the effects of lip augmentation with SMAS tissue alone and shows that these patients experience long-lasting improvement. This technique allows for use of the patient's own tissue with natural-appearing results and minimal risk.

Conclusions

SMAS lip augmentation following biplanar extended SMAS rhytidectomy is an effective and safe method for lip augmentation that can yield natural, long-lasting results with minimal risk for complications. On average, the degree of augmentation tends to fade slightly over time, but remains significant for at least 5 years postoperatively.

ARTICLE INFORMATION

Accepted for Publication: July 16, 2016.

Published Online: September 29, 2016.
doi:10.1001/jamafacial.2016.1145

Author Contributions: Dr Richardson had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis

Concept and design: Richardson, Rouso.

Acquisition, analysis, or interpretation of data: All authors.

Drafting of the manuscript: Richardson, Replogle.

Critical revision of the manuscript for important intellectual content: Richardson, Rouso.

Statistical analysis: Richardson, Replogle.

Administrative, technical, or material support:

Richardson, Rouso.

Study supervision: Richardson, Rouso.

Funding/Support: None reported.

Additional Contributions: We thank Cam Johnson, BS, of Rouso Facial Plastic Surgery Clinic, for his assistance with data and photograph collection using the electronic medical record. He was not compensated for his contributions beyond his regular salary.

REFERENCES

- Recupero WD, McCollough EG. Comparison of lip enhancement using autologous superficial musculoaponeurotic system tissue and postauricular fascia in conjunction with lip advancement. *Arch Facial Plast Surg*. 2010;12(5):342-348. doi:10.1001/archfacial.2010.67.
- Segall L, Ellis DAF. Therapeutic options for lip augmentation. *Facial Plast Surg Clin North Am*. 2007;15(4):485-490. vii. doi:10.1016/j.fsc.2007.07.005
- Niamtu J. Complications in fillers and Botox. *Oral Maxillofac Surg Clin North Am*. 2009;21(1):13-21. v. doi:10.1016/j.coms.2008.11.001
- Jacono AA, Quatela VC. Quantitative analysis of lip appearance after V-Y lip augmentation. *Arch Facial Plast Surg*. 2004;6(3):172-177. doi:10.1001/archfaci.6.3.172.
- Holden PK, Sufyan AS, Perkins SW. Long-term analysis of surgical correction of the senile upper lip. *Arch Facial Plast Surg*. 2011;13(5):332-336. doi:10.1001/archfacial.2011.55.
- Yoskovitch A, Fanous N. Correction of thin lips: a 17-year follow-up of the original technique. *Plast Reconstr Surg*. 2003;112(2):670-675. doi:10.1097/01.PRS.0000070940.29569.A5.
- Verret DJ, Leach JL, Gilmore J. Dual-porosity expanded polytetrafluoroethylene implants for lip, nasolabial groove, and melolabial groove augmentation. *Arch Facial Plast Surg*. 2006;8(6):423-425. doi:10.1001/archfaci.8.6.423.
- Castor SA, To WC, Papay FA. Lip augmentation with AlloDerm acellular allogenic dermal graft and fat autograft: a comparison with autologous fat injection alone. *Aesthetic Plast Surg*. 1999;23(3):218-223.
- Leaf N, Firouz JS. Lip augmentation with superficial musculoaponeurotic system grafts: report of 103 cases. *Plast Reconstr Surg*. 2002;109(1):319-326.
- Glasgold M, Lam SM, Glasgold R. Autologous fat grafting for cosmetic enhancement of the perioral region. *Facial Plast Surg Clin North Am*. 2007;15(4):461-470. vi. doi:10.1016/j.fsc.2007.07.002
- Moody MW, Dozier TS, Garza RF, Bowman MK, Rouso DE. Autologous superficial musculoaponeurotic system graft as implantable filler in nasolabial fold correction. *Arch Facial Plast Surg*. 2008;10(4):260-266. doi:10.1001/archfaci.10.4.260.
- Calderon W, Andrades PR, Israel G, Cabello R, Leniz P. SMAS graft of the nasolabial area during deep plane rhytidectomy. *Plast Reconstr Surg*. 2004;114(2):559-564.
- Stenekes MW, Van Der Lei B. Nasolabial fold augmentation with SMAS graft. *J Plast Reconstr Aesthet Surg*. 2012;65(12):1618-1621. doi:10.1016/j.bjps.2012.07.015.
- World Medical Association. World Medical Association Declaration of Helsinki: ethical principles for medical research involving human subjects. *JAMA*. 2013;310(20):2191-2194. doi:10.1001/jama.2013.281053
- Rossi AB, Nkengne A, Stamatias G, Bertin C. Development and validation of a photometric grading scale for assessing lip volume and thickness. *J Eur Acad Dermatol Venereol*. 2011;25(5):523-531. doi:10.1111/j.1468-3083.2010.03816.x.
- Kane MAC, Lorenc ZP, Lin X, Smith SR. Validation of a lip fullness scale for assessment of lip augmentation. *Plast Reconstr Surg*. 2012;129(5):822e-828e. doi:10.1097/PRS.0b013e31824a2df0.
- Werschler WP, Fagien S, Thomas J, Paradkar-Mitragotri D, Rotunda A, Beddingfield FC III. Development and validation of a photographic scale for assessment of lip fullness. *Aesthet Surg J*. 2015;35(3):294-307. doi:10.1093/asj/sju025.