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REVIEW ARTICLE

Impact of *subnasal lip lift* on *lip aesthetic*: a systematic review

Luiz Carlos Alves Júnior[1] · Natália Teixeira da Silva Cruz[1] · Bruno César de Vasconcelos Gurgel[1] · Ana Rafaela Luz de Aquino Martins[1] · Ruthineia Diógenes Alves Uchoa Lins[1]

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Abstract
This study is to perform a systematic review of the literature on surgical correction of the upper lip in order to assess whether the subnasal lip lift technique improves lip aesthetics and maintains its stability. A systematic search was carried out using the PubMed, Science Direct, Scopus, Cochrane Library and EMBASE databases, based on records published until July 2020. The quality of the included studies was assessed using the Cochrane Handbook for Systematic Reviews of Interventions. In the absence of randomized clinical trials, prospective or retrospective cohort studies, case control and case series were considered eligible. Of the 464 articles initially found by the two reviewers, 4 were selected, with 2 retrospective cohorts and 2 case series. The results of the studies showed that 92.4% of subnasal lip lift cases were performed in women with an age range between 21 and 65 years (mean of 36.6 years). Only one of the 4 studies did not contain information regarding the sex and age of the patients. The bull's horn excision pattern for subnasal lip lift was used to perform the subnasal lip lift in 75% of the included studies. All studies pointed to an improvement in lip aesthetics after the subnasal lip lift, based on anthropometric measures and the degree of patient satisfaction while maintaining results for varying periods of time (from 12 to 59.1 months). The studies included in this review suggest that the subnasal lip lift improves lip aesthetics in adult patients and maintains its stability for a certain period of time.

Keywords Aesthetic · Surgical · Lip lift · Subnasal lip lift

Introduction

Lips are the main contributors to aesthetic facial expression and the smile. Aesthetic changes and elongation in the upper lip occur with facial aging and cause concern for patients [1]. In this sense, surgical correction of the upper lip can give a more youthful and aesthetic appearance [2], being a standalone option or a complement to lip fillers, seeking to achieve patient autonomy [3].

According to the 2017 American Society of Plastic Surgeons statistical report, surgical lip augmentation has increased by 5% since 2016 and 60% since 2000 [4]. The lip lift is a simple procedure that consists of the removal of an ellipse of skin and subcutaneous tissue from the portion of the upper part of the lip immediately below the base of the nostril and can be performed in isolation or as a complement to other facial rejuvenation procedures [5]. Such a procedure is indicated for patients with aesthetic demands associated with the upper lip, such as an elongated lip filter and little exposure of the incisors and the vermilion of the upper lip. However, surgical manipulation of the lip structure must be approached with caution, since direct lip lifting violates the vermilion-filter complex, usually resulting in unpleasant scars [6].

Considering the lack of standardization of techniques, aesthetic parameters and long-term stability, this study intends to systematically review the surgical correction of the upper lip in order to assess whether the subnasal lip lift technique improves lip aesthetics and maintains its stability in adult patients.

✉ Ruthineia Diógenes Alves Uchoa Lins
aruthineia@gmail.com

[1] Department of Dentistry, Rio Grande Do Norte Federal University, Av. Senador Salgado FilhoLagoa Nova, Natal, RN 1787, Brazil

Materials and methods

Information sources and search strategies

Two authors (LCAJ and NTS) independently searched for articles published until July 2020 in the following databases: PubMed, Cochrane, Web of Science, Scopus and EMBASE. Controlled terms (MeSH) and keywords were combined whenever possible. The search strategy used the following combination of terms "lip lift" OR "Lip lifting" AND "subnasal lift" OR "subnasal lifting". An additional manual search of the bibliographic references of the studies included in this review was also carried out. Unpublished studies or gray literature were excluded, as they presented insufficient reports for analysis.

Literature selection and data extraction protocol

The titles and abstracts were used for the analysis of inclusion and exclusion criteria and the full texts of those considered potentially eligible were evaluated to verify their relevance through the RYYAN® program. Both reviewers extracted data from the selected studies independently and any disagreement was resolved by discussion between them.

The following data were extracted: amount of tissue removed surgically, amount of exposure of the labial vermilion, score of the upper lip/lower face, labial score/filter, edge of the labial vermilion/median lip filter height, labial height, nasolabial angle, angle of the upper lip, degree of patient satisfaction in the postoperative period, follow-up time and information about the existence of other associated techniques.

Quality assessment

The quality assessment of the included studies was carried out according to the type of study used in the review (Table 1). Thus, these studies were evaluated according to the Cochrane Handbook for Systematic Reviews of Interventions [7].

Results

Selection and characterization of studies

The systematic search of electronic databases identified 33 articles in PubMed, 42 in Scopus, 158 in Science Direct, no articles in Cochrane and 231 articles in EMBASE, totalling 464 articles. The manual search did not identify any articles. After removing the duplicates, 89 articles remained for reading the titles and abstracts. Of this total, 48 articles were selected for complete reading of the texts. After reading the full texts, only 4 studies met the inclusion criteria, while 44 were excluded (Fig. 1). One of the main reasons for exclusion from the studies was the fact that many of them did not have enough information for analysis criteria or did not answer the research question.

The 4 selected articles were comprised of 2 retrospective cohorts [2, 8] and 2 case series [3, 9]. Patients' age and sex were reported in 3 studies [3, 8, 9]. The age range observed in the studies was 21 to 65 years, with a mean age of 36.6 years, and the predominant sex was female, corresponding to 92.4% of cases.

These studies did not establish a relationship between the amount of tissue removed in the surgical procedure and dental exposure, in addition to using different methodologies for assessing changes in soft tissue, thus preventing a comparison through meta-analysis. One retrospective cohort [2] was conducted in the USA, without reporting ethnic differences, and the other [8] in South Korea. These studies evaluated a total of 217 patients. The case series studies [3, 9] were performed by Asian professionals, who performed the surgical procedure on 114 patients, without reporting the ethnic differences of these patients.

Table 1 Assessment of quality and risk of bias in the included studies (Cochrane collaboration manual) (Higgins, 2019)

	Selection bias		Performance bias	Detection bias	Friction bias	Reporting bias
Authors and year	1.Generation of random sequence	2. Hide allocation	3. Blinding of participants and professionals	4. Blinding of outcome evaluators	5. Incomplete results	6. Selective results report
[2]	High / -	High / -	High / -	High / -	Low / +	Low / +
[8]	High / -	High / -	High / -	High / -	Low / +	Low / +
Pan et al. 2017	High / -	High / -	High / -	High / -	Low / +	Low / +
Jung et al. 2018	High / -	High / -	High / -	High / -	Low / +	Low / +

Low /+ low risk of bias, *high /—* high risk of bias, *not clear /?* risk of uncertain bias

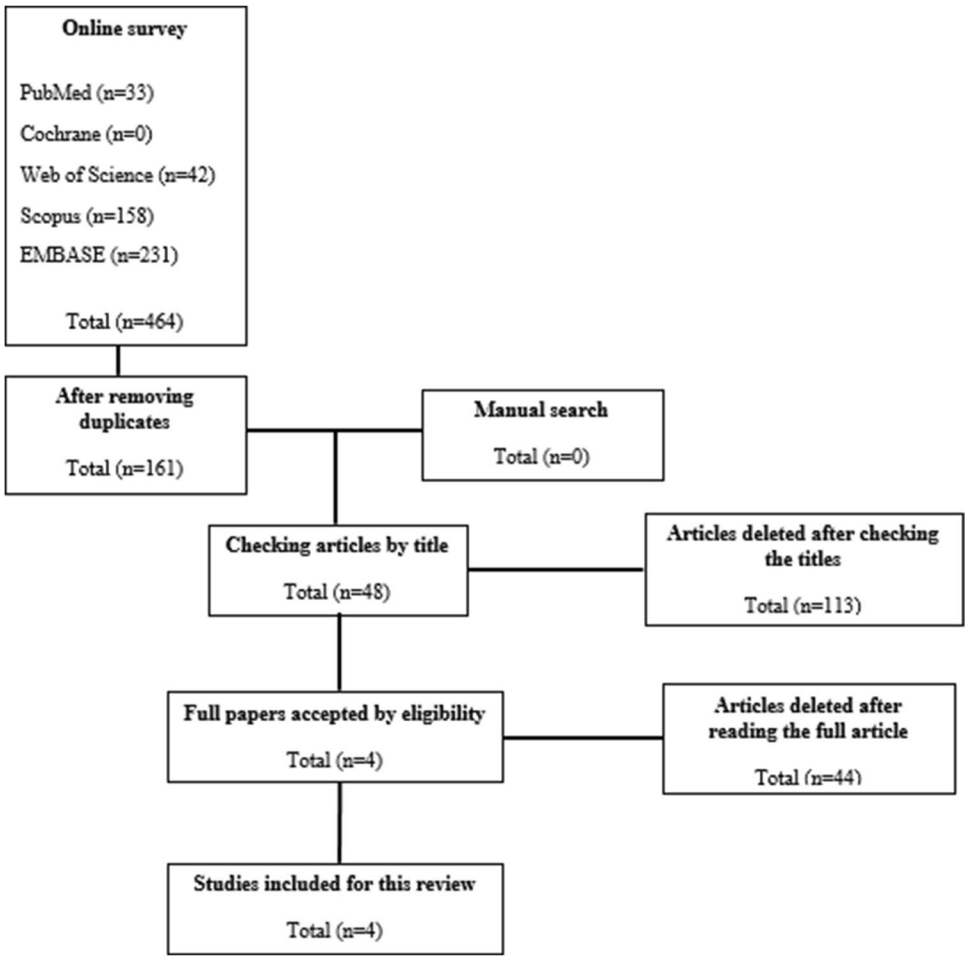

Fig. 1 PRISMA (Preferred Reporting of Systematic Reviews e Meta-analysis) flowchart

Clinical presentation

The indications for performing the subnasal lip lift were as follows: presence of labial rhytids, cupid's bow and unclear lip filter, ill-defined lip vermilion border, loss of lip projection [2, 3], congenital elongation of the lip filter, long vertical filter, asymmetric horizontal filter or invaginated upper vermilion [8]. Pan [9] made no mention of the indications for performing the subnasal lip lift technique.

Assessment, diagnosis and planning

For Holden et al. [2] and Lee et al. [8], facial analysis was necessary to assess the anthropometric parameters that are decisive for the diagnosis, and the use of photographs constituted an adequate method for planning. In some cases, the surgical goal was for the height of the subnasal line to the mouth was approximately 1/3 of the height of the lower third of the face [9].

Treatment

The bull's horn subnasal lip lift technique was the main technique used by the studies in this review [2, 8, 9]. This technique involves excising the skin and muscle of the upper lip immediately below the nasolabial junction, forming an incision that resembles a bull's horn. After excision, the tissue margins are sutured, causing the upper lip to rotate and elevate.

Some of the studies [8, 9] proposed changes in this technique. The study by Pan [9] proposed a resection of the T-shaped muscle after the incision between the subcutaneous and the orbicularis oris. Lee et al. [8], in turn, performed a "bull horn extended laterally", in which the incision was extended to the uppermost portion of the alar-facial groove, in order to promote a more lateral elevation.

The study by Jung et al. [3] used a subnasal lip lift technique in which a vertical skin bridge was left intact between the right and left incisions, made separately, following a design that started in the alar fold of the nose,

entered the nostril and ascended medially at the lower alar cartilage.

The amount of subnasal resection varied between 5 and 6 mm in two studies [2, 9], and in the other studies [3, 8], such measures were not reported.

Subnasal lip lift and improvement of lip aesthetics

Regarding the subnasal area's role in the lip lift and lip aesthetics, the results of the studies included in this review presented different evaluation criteria and preservation times; however, all of them revealed improvement in lip aesthetics after lip lift. Different anthropometric measures as parameters were used (exposure of the vermillion of the lip, height of the lip filter, nasolabial angle and angle of the upper lip) and sometimes the degree of patient satisfaction in the postoperative period.

In the study by Holden et al. [2], in which patients were followed up for an average period of 51 months, the surgical procedure performed in the test group improved the patients' anthropometric parameters, improving the length of the upper lip when compared to the control group. However, with facial aging, the results were similar to those observed in the control group. Although the results by Holden et al. [2] in the long run were similar to those of the control group, the final evaluation of lip aesthetics revealed an increase in the exposure of the vermilion of the upper lip, producing a more aesthetically pleasing appearance.

Jung et al. [3] described a series of cases, with 12 months of follow-up after the subnasal lip lift, in which an increase in the nasolabial angle and a decrease in the angle of the upper lip were observed to be associated with an increase in the lip projection. Observing the patient's profiles, evaluation of the final aesthetics revealed a significant change from each patient promoted by the change of contour of the upper lip, which gained more concavity, thus creating a more youthful appearance.

The ratio between the lip filter and the lip height decreased in the postoperative period, accompanied by a period of at least 24 months, in the studies by Lee et al. [8] and Pan [9]. In addition, in the study by Lee et al. [8], the length of the lip filter decreased, while the exposure of the lip vermilion increased in the postoperative period, establishing lip harmony and a more balanced facial profile. The study by Pan [9], in turn, highlighted an innovation proposed by the method to achieve good aesthetic results, in which a resection "T" design resulted in a more attractive vermilion, highlighting the lip tubercle. Table 2 shows the description of the main data extracted from the 4 studies in this review regarding lip aesthetics.

As for the degree of patient satisfaction in the postoperative period, only one of the studies included in this review did not mention this aspect [2]. Lee et al. [8] and Pan [9]

Table 2 Comparative table of data obtained between the studies selected in this review (Author, 2020)

Reference	Kind of study	Technique	Age	Amount of tissue removed?	Preoperative								Postoperative							
					VE	ULS	PLS	V/SNc	LH	NLA	AUL	RPP	VE	ULS	PLS	V/SNc	LH	NLA	AUL	RPP
Pan et al. 2017	CS	TS	31.2 a 5 mm (21–52)			0.41+—0.04	3.13+-0.32		-	-	-	-	-	0.36+-0.03	1.98+—0.35		-	-	-	-
[2]	RC	TS	- 5–6 mm		-	-	-	0.45	-	-	-	-	-	-	-	0.38	-	-	-	-
Jung et al. 2018	CS	BS	48,7 a - (28–35)		-	-	-	-	-	91.33+-4,19	48.97±2.41	0.84±0.08	-	-	-	-	-	105.62±5.04	38.21±3.34	1.06±0.09
[8]	RC	TS	30 a - (21–65)		3.93±2.27 mm	-	3,84		-	25.61±4.83 mm	-	-	6.16±1.74 mm	-	2,17		-	19.87±3.45 mm	-	-	-

CS case series, *RC* retrospective cohort, *TS* total subnasal, *BS* bilateral subnasal, *VE* vermilion exhibition, *ULS* upper lip/lower face score, *PLS* lip score/filter, *V/SNc* lip vermillion edge/medium lip filter height, *LH* lip height (filter), *NLA* nasolabial angle, *AUL* angle of the upper lip, *RPP* reason for point projection

reported that 92.1% and 96.1% of patients, respectively, were satisfied or very satisfied, while Jung et al. [3] revealed that 100% of patients expressed satisfaction with the surgical results achieved.

Stability

The follow-up period was present in all studies, varying between 12 and 59.1 months, with an average time of approximately 28 months. All of these studies revealed maintenance of the results achieved during the different periods of observation with a low revision rate. The retrospective study by Lee et al. [8] monitored patients for an average of 25.4 months and the two case series [3, 9] monitored patients for 24 and 12 months, respectively. The study by Holden et al. [2], despite evaluating patients for an average time of 51 months, found that the improvement of lip aesthetics is still sustained for an average of 5 years.

Discussion

The results of this review pointed to an improvement in lip aesthetics after the subnasal lip lift and over the follow-up periods, despite the lack of standardization of the techniques used and results found. In addition, the included studies made their own evaluations using facial relationships such as upper lip/lower face score (ULS), lip score/filter (PLS), lip vermillion edge/average lip filter height (V/SNc) and projection ratio of the nasal tip (RPP), created only to measure changes resulting from surgical procedures. Therefore, there are no consolidated parameters in the literature that would allow comparison between results [2, 3, 8, 9].

Lip aesthetics is very subjective and, according to Heidekrueger et al. [10], differs between cultures, sex and age, making the definition of a perfect lip aesthetic after the lip lift imprecise, in an isolated or combined manner. In this systematic review, anthropometric measures associated with facial relationships and the degree of patient satisfaction were used to determine the improvement of lip aesthetics based on other studies [11–14].

The authors of the included studies agree that the main indications for the subnasal lip lift are aesthetic changes involving the lip filter, the vermillion of the lip and the lip commissure [2, 3, 8]. The surgical procedure of lip suspension with the removal of subnasal tissue also increases dental exposure at rest [6, 15], thus reducing the effects of aging. There is still no evidence in the literature about the exact amount of subnasal surgical resection needed to promote noticeable dental exposure, and the evidence also lacks a standardization of the surgical technique; for this reason, this article suggests a simplified scheme for performing the lip lift technique (Fig. 2).

The classic study by Vig et al. [19] showed the gradual decrease in exposure of incisors at rest, which occurs with aging and is associated with an increase in lip height. According to these authors, the exposure of incisors at rest went from an average of 3.37 mm in individuals under 29 years of age to 1.58 mm in the group of individuals between 30 and 39 years, thus revealing a 46% decrease in incisor exposure with aging, which could justify the indication of lip lift to increase dental exposure in adult patients.

With regard to the age group of patients, the average age of the individuals investigated in the present review (36.6 years) was similar to that observed in several other studies involving facial aesthetic procedures [2, 3, 8, 9], thus confirming that adult patients represent the population that most seeks the lip lift.

Regarding sex, the majority of patients operated on in the studies in this review were women, which could be related to a greater aesthetic demand for a more attractive and youthful lip. Penna et al. [16] used magnetic resonance imaging (MRI) and histological analysis on cadavers and found a statistically significant decrease in the thickness of the upper lip in males when compared to females ($p = 0.213$), with similar histological changes between genders. However, these changes were less noticeable in men, which would explain why fewer male patients seek out lip rejuvenation. These data corroborate the findings of [17] who observed a decrease in the ratio of the upper lip to the lower lip only in women.

The study by Popenko et al. [11] quantified the ideal and attractive female lip. These authors concluded that the vermillion of the upper lip must have 9.6% of the height of the lower third of the face, in addition to maintaining a 1:2 ratio of the upper/lower lips. Therefore, using only the relationship of the upper lip to the lower third of the face, reported in some studies as a parameter, appears to be insufficient for diagnosis and planning. In this systematic review, none of the included studies reported an accurate facial analysis and its relationship with the amount of tissue to be resected for a positive aesthetic outcome.

Sociocultural differences also determine the preferences and aesthetic demands of a population. Latin Americans prefer larger lips as well as North Americans and Europeans, while Asians prefer smaller lips. Rhee et al. [18] evaluated faces considered attractive by Caucasians and Asians and found that the proportions of the height of the upper and lower lips were approximately 32.1% and 67.9%, respectively, in the Caucasian face and 31.2% and 68.8%, respectively, in the Asian face. Thus, these authors concluded that facial attractiveness does not follow the theory of Vitruvian thirds and that the upper lips considered attractive are the thickest. Therefore, considering the findings and limits of this review, it is possible to state that the lip lift could produce satisfactory aesthetic results in these populations that

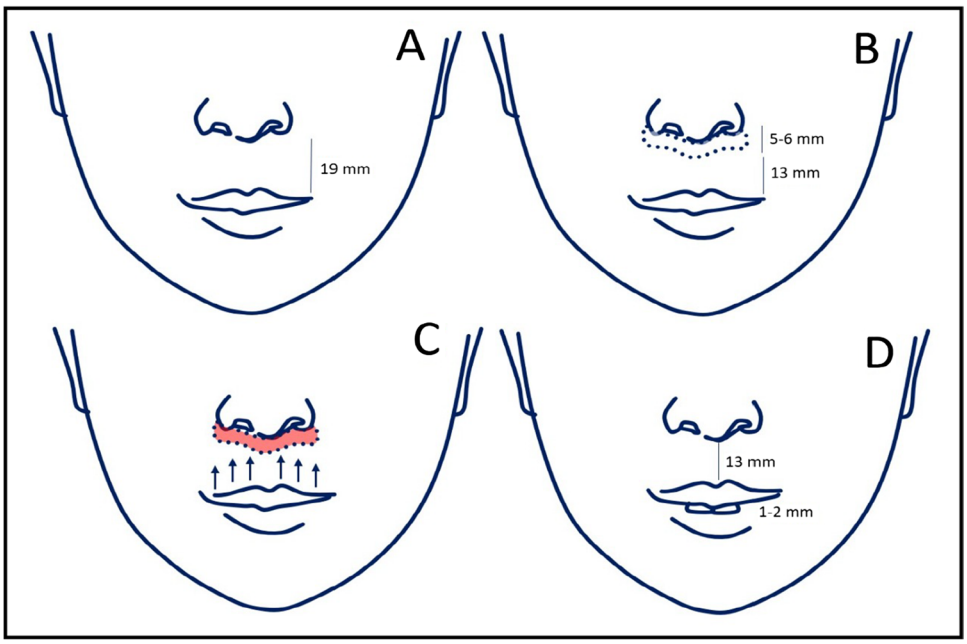

Fig. 2 Summarized and simplified diagram of the subnasal lip lift procedure. A contoured ellipse is marked under the nose following the nose-lip junction just outside the nasal sill and 1 mm away from the alar crease. The amount of subnasal resection varied between 5 and 6 mm. The skin is incised up to the superficial fascial layer, and then the incision is closed

prefer a more voluminous upper lip, with greater projection and greater exposure of the labial vermilion.

In Asian patients, the nasolabial angle was considered attractive when close to 109.5° (Rhee et al. 2019). This result indicated that the Asian face had a slightly sharp angle and an even more prominent upper lip compared to the Caucasian face. Thus, in the study by Jung et al. [3], in which the lip lift increased the nasolabial angle by 14.69°, going from an average of 91.33° to 105.62°, it is possible to conclude that the surgical procedure in question improved the attractiveness in the perioral region, making the lip more attractive. Furthermore, the study by Rhee et al. (2019) also showed that the most attractive lip height in Asian women was 20.2 mm. Therefore, considering that in the study by Lee et al. [8], the subnasal lip lift reduced the lip height (subnasal-stoma) by 5.74 mm, taking patients who previously had 25.61 mm of lip height to 19.87 mm, it is then suggested that the surgical lip lift can improve anthropometric indices of patients. Regarding the degree of patient satisfaction in the postoperative period, most studies [3, 8], Pan et al. 2017) showed a percentage between 92 and 100% of satisfied patients. As also reported by Yamin et al. [12], when assessing the degree of patient satisfaction after cosmetic surgery using the subnasal lip lifting technique with a bull's horn, they identified that the percentage of satisfied or very satisfied patients was 92.1%. The degree of patient satisfaction can, therefore, be used as an important parameter for comparing the improvement of lip aesthetics and the results achieved.

Regarding the stability of the technique, the studies included in this review verified the maintenance of results during the follow-up period, reporting an extremely low revision rate. This revision is recommended only in the case of recurrences, scarring or other complications. In the case of recurrences, [15] suggest an overcorrection of 25% in order to compensate for them.

Although the studies in this review indicate positive results for the subnasal lip lift, it was not possible to verify the relationship between the amount of tissue resection and the level of lip repercussion and dental exposure, thus making it necessary to carry out randomized, controlled clinical trials with longer follow-up time.

Conclusion

The included studies suggest that the subnasal lip lift improves lip aesthetics and maintains its stability for a certain period of time (± 28 months) in adult patients. However, as there is still no standardization in the planning and technique of tissue resection, the clinical application of this procedure requires additional studies.

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Declarations

Ethics approval Not applicable.

Consent to participate Not applicable.

Consent for publication The authors authorize the publication.

Competing interests There is no conflict of interest to declare.

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