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Major clinical outcomes and analysis of the risk of bias of the advances in cervicofacial liposculture: a systematic review

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Abstract

Introduction: In the context of liposculpture, cervicofacial liposuction involves the application of negative pressure through a hollow cannula in the subcutaneous plane to gently avulse fat cells and accurately sculpt unwanted fat deposits on the face and neck. Furthermore, lipo contouring provides a versatile tool in the facial surgeon's arsenal to achieve the desired facial profile. In 2020, approximately 15.5 million cosmetic procedures were performed in the United States alone. **Objective:** A systematic review was carried out on the main clinical results, presenting studies on the risk of bias, and the advances in facial and cervical liposculpture as an important aesthetic tool for the dental surgeon. **Methods:** The rules of the Systematic Review-PRISMA Platform were followed. The search was carried out from November 2021 to February 2022 in Scopus, PubMed, Science Direct, Scielo, and Google Scholar databases. **Results:** 64 articles were found involving liposculpture. A total of 32 articles were fully evaluated and 14 were included and developed in the present study. Considering the Cochrane tool for risk of bias, the overall assessment did not result in significant risk of bias studies. The Funnel Plot showed symmetrical behavior. Twenty-five studies did not meet the GRADE. Most patients who were involved in the studies showed improvements in facial augmentation and contouring. In patients with loss of facial volume, high-density fat transfer with the facial injection of SVF-gel resulted in significantly higher improvement scores and better patient satisfaction. **Conclusion:** According to the main clinical studies selected in the present study, cervicofacial liposculpture proved to be safe and effective. In patients with loss of facial volume, high-density fat transfer with a facial injection of SVF-gel resulted in significantly higher improvement scores and better patient satisfaction. Still, the results of the studies showed that the level of self-confidence and mental health-related quality of life can be significantly improved after facial lipofilling treatment.

Keywords: Liposculpture. Fat grafting. Lipo contour. Facial liposculpture. Cervical liposculpture. Aesthetics. Clinical trials.

Introduction

In the context of liposculpture, cervicofacial liposuction involves the application of negative pressure through a hollow cannula in the subcutaneous plane to gently avulsion fat cells and accurately sculpt unwanted fat deposits on the face and neck. Furthermore, lipo contouring provides a versatile tool in the facial surgeon's arsenal to achieve the desired facial profile [1-3]. In 2020, approximately 15.5 million cosmetic procedures were performed in the United States. Minimally invasive techniques that allow for faster recovery are especially in demand. According to The Aesthetic Society's 2018 report, liposuction is the second most popular cosmetic procedure in the United States [1].

Also, in recent decades, improvements have been observed in the techniques of suspending the superficial musculoaponeurotic system and adjacent fat pads. Thus, liposculpture (LS) can complement cervicofacial aging surgery [2,3]. Minimally invasive procedures in facial liposculpture are expanding and the transfer of adipose tissue can result in ideal esthetic effects [3-5].

Thus, current liposuction techniques have evolved over the years. Initially, direct excision of unsightly fat pads as described in combination with superficial musculoaponeurotic system (SMAS) facelift. Fat can be removed through submental and post-auricular rhytidectomy incisions, or excess ptotic fat and skin can be excised directly from the jowls and dewlap. However, as it is technically challenging to remove subcutaneous fat deposits evenly with open techniques, these attempts often produce uneven skin contours.

In this regard, lipo contouring techniques provide a means to shape the neck and face fat deposits to better obtain the desired facial profile [6]. The resulting overall improvement has direct and indirect effects on facial esthetics. For example, submental liposuction produces a more pleasant acute cervicomental angle and, at the same time, gives the illusion of greater projection of the chin [7].

In this sense, historically, direct excision of skin and fat led to long visible scars that were predisposed to central depression and postoperative dog-ear formation. Given the often unsatisfactory results obtained with direct excision of fat, it was not uncommon for surgeons to ignore the accumulations of preparation, nasolabial, submental, and cervical fat, in many cases producing a marked discrepancy in the rejuvenated appearance of the upper face compared to the face. lower and neck [8].

In this context, during the last decades, the introduction of refined liposuction techniques, in addition to platysma plication and surgical tightening of the excess neck skin, gave the facial plastic surgeon the ability to improve the contour of the jaw and definition of the cervicomental angle. The versatility of the liposculpture procedure, used alone or in combination with rhytidectomy, malar and chin implants, mentoplasty and other adjuvant procedures of facial plastic surgery, combined with its excellent results, with only small cosmetically hidden scars, technical ease and minimal morbidity and recovery, popularized its use [7].

Thus, dental surgeons began to apply these principles to the neck and jowls for facial rejuvenation through minimal access incisions, including endoscopic ultrasonographic lipectomy and the use of liposhavers. Facial EL focuses on repositioning adipose tissue and increasing facial transition zones. This is accomplished by employing internal suspension sutures, as well as with autologous fat grafting [6]. Therefore, LS is an alternative to facial rejuvenation that involves the skin, release of the retaining ligaments, and appropriate removal of adipose tissue from the subcutaneous layer, while improving skin tone and facial contour.

Also, a study presented experiences with 312 patients who underwent cervicofacial rejuvenation, demonstrating the benefits of liposculpture in cervicofacial rejuvenation in terms of reducing marionette wrinkles, perioral mound removal, V-shaped facial contour, defined jaw, reduced double chin, protrusion chin visual, and cervicofacial lift [7]. Thus, liposuction was a watershed in the evolution of cervicofacial LS, allowing the permanent removal of excess adipose tissue located under the skin. Also, several therapeutic means are in constant improvement, such as the use of cutting cannula followed by blunt cannula, laser/ultrasound-assisted liposuction, as well as rotating and vibrating cannula [8].

Therefore, the present study aimed to carry out a systematic review of the main clinical results, presenting studies of the risk of bias, and the advances of facial and cervical liposculpture as an important aesthetic tool for the dental surgeon.

Methods

Study Design

The rules of the Systematic Review-PRISMA Platform (Transparent reporting of systematic reviews and meta-analysis-HTTP://www.prisma-statement.org/) were followed.

Data Sources And Research Strategy

The search strategies for this systematic review were based on the keywords (MeSH Terms): “Liposculpture. Fat grafting. Lipocontour. Liposculpture face. Cervical liposculpture. Aesthetics. Clinical trials”. The search was carried out from November 2021 to March 2022 in Scopus, PubMed, Science Direct, Scielo, and Google Scholar databases. In addition, a combination of keywords with the Booleans “OR”, “AND” and the “NOT” operator were used to target scientific articles of interest.

Study Quality And Risk Of Bias

The quality of the studies was based on the GRADE instrument [9] and the risk of bias was analyzed according to the Cochrane instrument [10].

Results and discussion

Findings Summary

It was found 64 articles involving facial and cervical liposculpture. Initially, article duplication was excluded. After this process, the abstracts were evaluated and a new exclusion was performed, removing the articles

that did not include the topic of this article. A total of 32 articles were fully evaluated and 14 clinical studies were included and developed in the systematic review. Twenty-five studies did not meet the GRADE (**Figure 1**). Considering the Cochrane tool for risk of bias, the overall assessment did not result in significant risk of bias studies (**Figure 2**).

Figure 1. Article selection (Systematic Review, N=14 clinical studies).

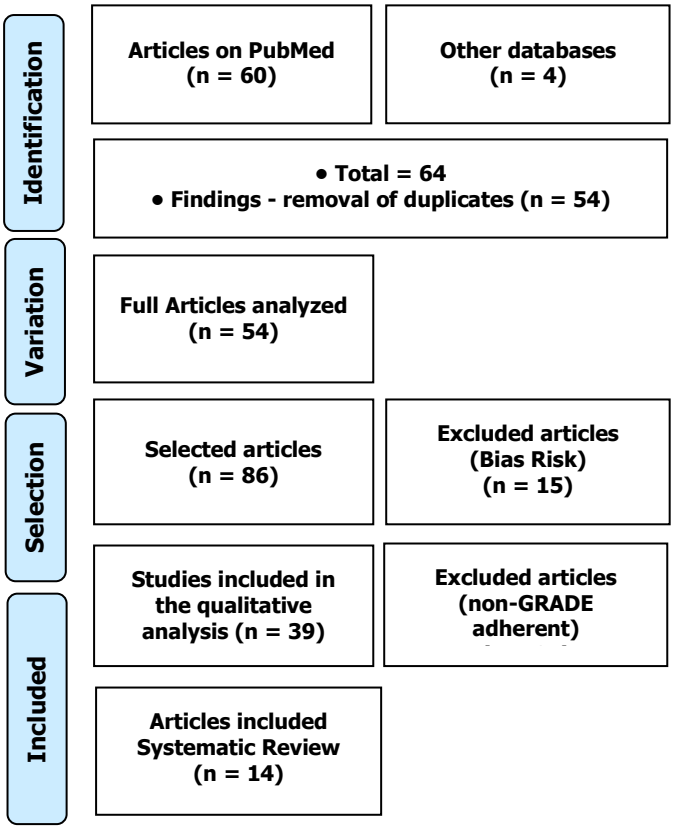


Figure 2 presents the results of the risk of bias in the studies using the Funnel Plot, through the calculation of the Effect Size (Cohen's Test). The sample size was determined indirectly by the inverse of the standard error (1/Standard Error). The graph showed symmetrical behavior, not suggesting a significant risk of bias in the studies with small sample sizes that are shown at the bottom of the graph.

Figure 3 presents three illustrative images, where images A and B represent the positioning and penetration of the cannula for liposuction, and image C represents the result of the reduction of adipose tissue in the highlighted region. The images belong to a patient (with confidential information, without presenting the clinical case) of the authors of the present study, in order to exemplify the liposculpture procedure, as well as to demonstrate that the procedure can be performed safely.

Genetic, Epigenetic, and Pathophysiological Aspects as Predictors for Liposculpture

The cervicofacial characteristics of each individual are determined by the underlying bone and cartilaginous structure and the coverage of the skin and soft tissue envelope. These characteristics are all determined at the genetic level but can be influenced to varying degrees by environmental factors (epigenetics) such as nutrition, exercise, aging, medications, exposure to toxins, actinic damage, trauma, and surgery [11,12].

As adverse epigenetic factors exert their impact, ptosis of the facial support structures causes the malar and buccal fat pads to fall. The loss of skin elasticity produces thick and thin wrinkles and sagging of the facial skin. Tissue laxity and maldistribution of fat deposits lead to the formation of double chin and dewlap, redundant loose tissue hanging over the mandible and chin, respectively. In the neck, fat accumulation and platysma ptosis result in prominent bands producing a "turkey-eater" appearance. Patients with congenitally low hyoid bones have a more compromised definition of the cervicomental angle [12].

Figure 2. The symmetrical Funnel Plot does not suggest a risk of bias between the small sample size studies that are shown at the bottom of the graph.

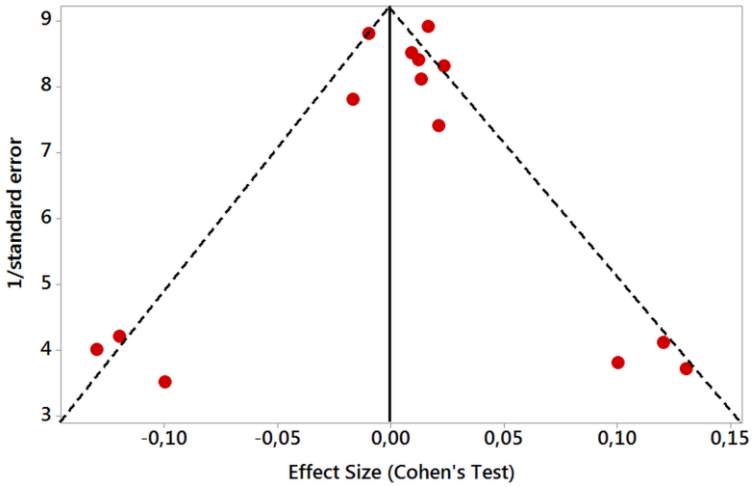
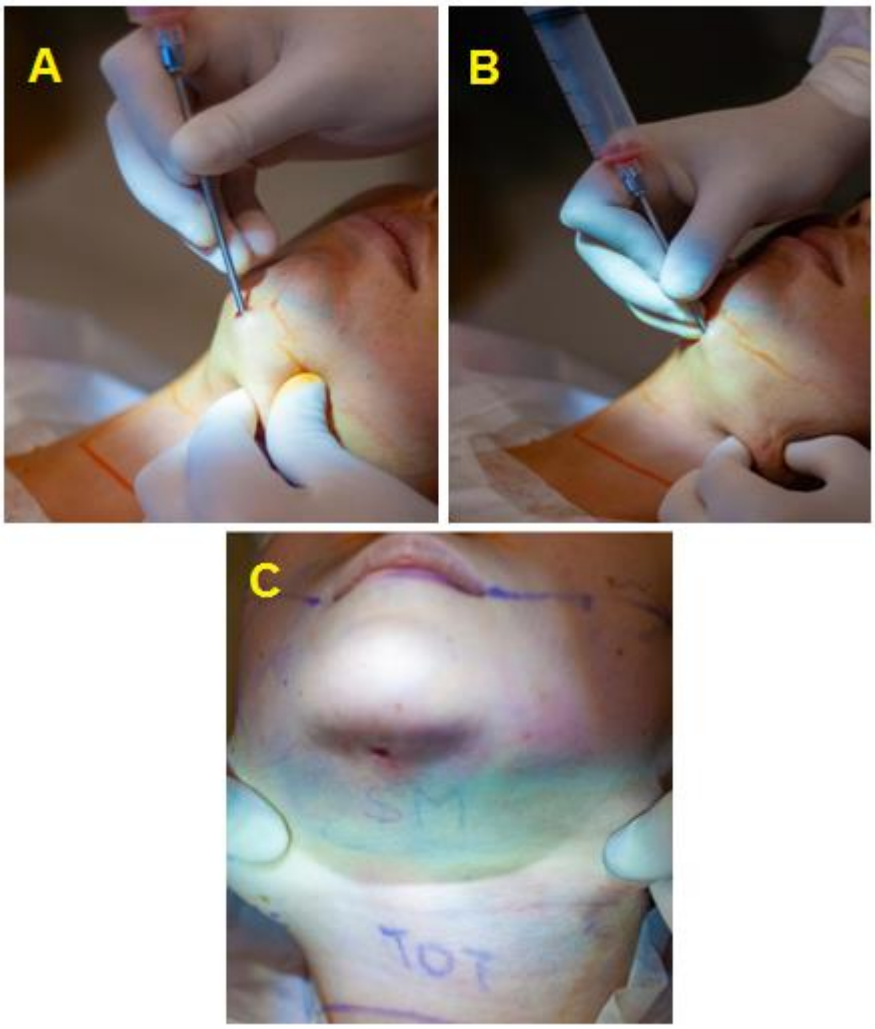


Figure 3. Three illustrative images, where images A and B represent the positioning and penetration of the cannula for liposuction, and image C represents the result of the reduction of adipose tissue in the highlighted region.



Source: Own author.

Furthermore, the loss of fat on facial was emphasized as a component of aging [12-14]. Volume reduction, particularly in the periorbital, cheek, and perioral areas, plays a prominent role in creating a facial cavity and skin laxity. Removal of body fat from sites and subsequent reinjection into areas of atrophy is ideal [15-18]. Fat viability is influenced by several factors, including harvesting method, cleaning, particle size, and reinjection cannula size. Minimizing vacuum extraction pressure causes less immediate cell trauma. The smallest cannulas should match the injection cannula to minimize transfer compression. Cleaning can be carried out by rinsing or centrifuging. Smaller pieces of adipose tissue are recommended to minimize lumps and increase surface area [19].

In this context, it is noteworthy that the most common areas of fat injection are the cheeks and nasolabial folds, where the tissue is thicker and muscle movements are minimal. Periorbital injections are another option, but very fine particles are needed to prevent lumps from forming. The perioral area and lips are the least predictable in retention, presumably because of underlying muscle movement [7].

Also, some young individuals have a genetic propensity for undesirable facial fat distribution despite normal body weight. For example, the baby's submental accumulation of fat can persist into adulthood. These patients usually have excellent skin and muscle tone and may benefit only from selectively closed liposuction. Fat accumulation in adulthood can occur due to adipocyte hyperplasia and not cell division. Liposuction reduces the total number of adipocytes by directly removing cells and inducing localized apoptosis as a result of mechanical trauma and devascularization. Adipocytes that remain after LS are a stable population and are not more prone to hyperplasia than are adipocytes elsewhere in the body. Thus, the improvement of the facial profile after liposuction is maintained as long as there is no generalized excessive weight gain [3].

Major Postoperative Care

Postoperative management is divided into the

immediate postoperative period (the first 24 hours) and the subsequent period. Immediate postoperative care focuses on preventing hematoma through blood pressure control. Again, for practical purposes, the systolic blood pressure level is more indicative than the diastolic one. Maintenance of a postoperative systolic pressure of less than 140 mm Hg is desirable [20].

Intraoperative treatment with a 0.1 to 0.2 mg clonidine transdermal patch often attenuates injection-associated hypertension and subsequently the absorption of epinephrine into the local anesthetic solution. In patients who are not on blood pressure medication (particularly beta-blockers), intraoperative hypertension can be controlled with 5 to 10 mg boluses of labetalol. It is important to avoid adding additional beta-blockers in patients who are already beta-blocked and showing relative bradycardia. Within such patients, 0.25 mg bolus of calcium channel blockers such as nicardipine can be administered intraoperatively. Adrenaline injected from the local anesthetic solution is slowly absorbed, so post-operative bruising usually occurs four to 10 hours after surgery. Postoperatively, labetalol can be administered orally in doses of 100 mg. Alternatively, a pure alpha agonist (such as 0.1 to 0.3 mg clonidine) can be administered orally [21].

Also, prolonged post-operative swelling can cause facial skin relaxation stress and lead to a compromised outcome. The degree of postoperative edema is related to the extent of the dissection, not the depth. Limited salt intake (preferably 1000 mg/day) and reduced fluid intake may also be beneficial. The potential value of perioperative corticosteroids remains controversial. While craniomaxillofacial surgeons felt it was beneficial, 199,200 others found no benefit for facelift swelling [20,21].

Major Complications [3]

- ✓ Hematoma
- ✓ Skin Necrosis
- ✓ Infection
- ✓ Nerve Injury
- ✓ Fibrosis
- ✓ Deformities (hypotrophy or hypertrophy)

Major Clinical Studies – Systematic Review Analysis (N=14 clinical studies)

In the context of lipofilling and liposculpture, treatment to improve skin characteristics related to aging such as wrinkles, pigmentation spots, pores, or rosacea has become a practice to improve the health of the skin and the whole organism, as this positively impacts the quality of the skin. patients' lives. In this sense, optimizations are being carried out. Thus, different additives such as platelet-rich plasma (PRP) or stromal vascular fraction (SVF) have been combined with lipofilling to increase the therapeutic effect and stability of adipose tissue-derived stromal cells (ASCs). For this purpose, a randomized, prospective, double-blind, placebo-controlled study examined the hypothesis that mechanically isolated SVF enhances the therapeutic effect of lipofilling supplemented with PRP to improve facial skin quality. In total, 28 women were enrolled; 25 completed follow-ups within 1 year of the postoperative period. Compared with PRP-supplemented lipofilling, PRP-supplemented lipofilling combined with SVF did not improve facial skin quality or patient satisfaction in a healthy population, but it was a safe procedure [22].

Furthermore, a study investigated the impact of an aesthetic intervention on the self-perception of improved facial appearance and quality of life (QoL) after 1 and 6 months of follow-up. A total of 63 consecutive individuals undergoing facial lipofilling were included in the study. There was a statistically significant improvement in QoL at each subsequent time point, compared to baseline, across the SF-36 domains, except for the physical functioning and pain subscales. It is noteworthy that advanced social life was strongly associated with improved satisfaction with facial appearance, better self-esteem, and lower levels of anxiety and depression during the follow-up period after facial lipofilling. The results of this study supported the hypothesis that the level of self-confidence and mental health-related quality of life can be significantly improved after facial lipofilling treatment [23].

Also, there is a quest for a slimmer face with preservation of the inverted triangle of youth with buccal fat pad excision, facial liposuction, and injection lipolysis. The rounded appearance at the angles can be further reduced by injecting botulinum toxin into the masseter. In this regard, a study of 40 patients with round faces was analyzed and treated by facial sculpting surgery, which included at least two of the combined procedures. Procedures included facial liposuction, buccal fat pad excision, chin augmentation, malar augmentation, and injection lipolysis. Patients' aesthetic expectations were met in 39 cases. A combination of procedures is required to give the face an attractive contour [24].

Besides, Yang et al., 2019 [7] that was an observational retrospective with 312 patients (mean age 53.3 years) that was performed in a single medical clinic. Of the 312 patients (261 women and 51 men), 197 underwent cervicofacial liposculpture, 54 underwent liposculpture of other regions, and 61 were treated with liposculpture of the lower face. Patients who had an Illoz test index <20%, with mild or moderate excess skin on the lower face, are recommended liposculpture of the lower face, and light or moderate excess skin in the

submental area (according to the pinch test) is suggested for cervical liposculpture. Also, before and during the operation the patient was obliged to grimace, whistle and smile. The volume of liposculpture was between 30 mL and 100 mL. Postoperative wound closure was not performed. The compression band was used for 5 days. Of the 312 patients, only three had unsatisfactory results. In the postoperative results, only two patients had wrinkles and one patient had facial contour irregularities. The three patients were rescued with a micro fat graft and achieved satisfactory results after the second operation. Also, patients who underwent cervicofacial liposculpture showed reduced wrinkle puppet, perioral mound removal, V-shaped facial contour, defined jawline, double chin reduction, visual chin protrusion, and cervicofacial elevation. Therefore, cervicofacial liposculpture proved to be advantageous, in safety and efficacy.

Furthermore, a study with 210 patients evaluated the aesthetic results and patient satisfaction after bimaxillary orthognathic surgery with or without simultaneous facial lipofilling procedures. A patient questionnaire was used to assess perceived improvement in esthetics. One hundred and twenty patients (mean age 20.3 years) underwent bimaxillary orthognathic surgery and simultaneous facial lipofilling procedures (group I). The remaining 90 patients (mean age 19.8 years) underwent skeletal procedures only (group II). The overall esthetic improvement was similar in both groups (group I 92.5%, group II 91.1%). Higher higher-level esthetic improvement scores were recorded for group I (group I 80%, group II 55.6%). Overall patient satisfaction was 98.3% for group I and 97.8% for group II. Higher-level satisfaction scores were recorded for group I (group I 14.2%, group II 6.7%). The simultaneous use of autologous fat micrograft is a promising technique that can improve the aesthetic results of orthognathic surgery, leading to greater patient satisfaction [25].

In addition, autologous fat grafting targeted at the LS process is commonly used for soft tissue augmentation and reconstruction, however, it is limited by a high graft absorption rate. Stromal vascular fraction gel graft/Stromal vascular fraction (SVF-gel) for facial volume augmentation may have a positive effect on skin rejuvenation, however, its major limitation is the low conversion rate of Coleman's fat. In this regard, one study investigated a new surgery using high-density fat in combination with SVF-gel in the treatment of hemifacial atrophy or Romberg's disease. From October 2017 to October 2019, 13 patients with hemifacial atrophy underwent high-density fat transfer with SVF-gel injection. The result was determined by the difference in the pre and postoperative FACE-Q modules (FACE-Q conceptual structure: 1, Satisfaction with Facial Appearance; 2, Health-Related Quality of Life; 3, Negative Sequelae; 4, Satisfaction with the Care Process). Cosmetic results were observed during follow-up periods, with no adverse events observed in the treatment group. All patients showed improvements in facial augmentation and contouring. In patients with loss of facial volume, high-density fat transfer with a facial injection of SVF-gel resulted in significantly higher improvement scores and better patient satisfaction. The preoperative and postoperative results of the FACE-Q modules reported by the patient showed statistically significant improvement [26].

Furthermore, a prospective controlled study evaluated the 6-month contouring efficacy of 1470 radial fiber-assisted liposuction and the effect of a volumetric increase of tissue harvested in facial fat grafting. Twenty individuals underwent lower abdominal or external thigh liposuction. In seven individuals, samples were grafted onto facial regions. Treatment safety, body weight, esthetic improvements rated by the blinded evaluator, and subject-rated satisfaction were monitored for 6 months. Abdominal and facial fat thickness was assessed by magnetic resonance imaging (n=5) within 3 months of treatment. One month after treatment, most subjects rated improvements as good/excellent (88%) and skin tightening satisfactory/very satisfactory (92%), with over 70% of subjects providing similar scores 6 months after treatment. Improved/much improved aesthetic appearance (87%) was observed. Harvested tissue injected as a facial filler (21.0 ± 5.2 ml) led to a 0.63 ± 0.12 mm increase in facial fat thickness, as observed by MRI, at 3 months. Six months after completion, most subjects (83%) were satisfied with the result. All procedures were well tolerated [27].

Despite this, several problems such as facial lipodystrophy and changes in the skin and skin texture have not yet been fully resolved. Thus, a retrospective observational clinical study analyzed the use of the Lipo-Facelift procedure, which consists of facial liposculpture performed simultaneously with a bivector biplanar facelift procedure of the submucosal aponeurotic system. The authors analyzed pre-and post-surgical photographs of 12 Lipo-Facelift patients after 3 and 12 months and analyzed their medical records for complications. In addition, CO2 measurement was performed to assess the improvement of microcirculation. The longest follow-up period was 8 years. The Lipo-Facelift demonstrated very satisfactory results and no surgical intervention or revision was required. The results showed a lasting improvement in skin quality [28].

In the previous study, the results can be achieved

due to the improvement of angiogenesis due to the growth factors transferred in the lipoaspirate, as well as in the presence of adipose mesenchymal stem cells, and exosomes, microRNA, and pericytes. Furthermore, the differentiation of progenitor cells into fibroblasts and increased collagen production contribute to firmer skin [29]. In particular, Coleman's lipo structure is a procedure for transferring adipocytes, based on rigorous methodology and the use of specific material [30].

In this sense, a retrospective study involved 100 patients who underwent volumetric facial restoration with facelift and liposculpture. The mean surgery time was 15 months. Overall patient satisfaction was 82% with a mean score of 15/20 in the subjective assessment and 13.3/20 in the objective assessment. The results differed significantly according to the facial aesthetic subunit involved, with the best results being obtained in the malar region and cheek, and the least satisfactory in the upper and lower lips. Prolonged edema was the only complication (8%) [31].

Furthermore, a prospective clinical study described the surgical results with special emphasis on complications in patients undergoing high-definition liposculpture. A total of 417 patients underwent high-definition liposculpture between 2015 and 2018. Primary liposuction and secondary liposuction were performed in 308 (74%) and 109 (26%), respectively. Combined surgeries were performed in 121 cases (29%). There were no systemic complications. Local complications included hyperpigmentation (n=276), seroma (n=125), nodular fibrosis (n=83), unsatisfactory definition in the areas of superficial liposuction (n=16), unnatural appearance of the body contour (n=17), VASER-related burns (n=3) and Mondor syndrome (n=2). Most patients (94%) were satisfied with the results [32].

Also, a retrospective clinical study demonstrated that a spectrum of liposculpture definitions can be achieved using Power-Assisted Liposculpture (PAL) liposuction. The authors described satisfaction and complication rates. Fifty male patients were included in this study between January 2018 and November 2019. The mean age was 37.34 years. The mean body mass index was 26.4 kg/m2. A total of 54.3% of patients opted for the high definition (HD), 36.4% for the moderate definition, and 9.2% for the light definition. There were no major complications. The HD subgroup had the highest incidence of minor complications (21%). Patient satisfaction levels were high in all 3 subgroups, with the highest scores in the HD subgroup (9.3/10) [5].

Finally, efforts to achieve predictable skin retraction have largely neglected the importance of the adipose tissue removal mechanism, focusing instead on the depth of the surgical plane and the vacuum pressure used. Recent experimental and clinical evidence points to the role of mechanical displacement as a key factor in the removal of adipose tissue. Thus, a modification of an existing cannula design was used to achieve predictable skin retraction on the face and neck in a series of 75 patients with a 3-month to 3-year follow-up. Elevation of the facial and cervical flap with this instrument (with or without deep tissue tightening and skin excision) showed consistently improved results, improving skin tone and facial contours while decreasing recovery and operative time. The combination of the described technique and existing techniques such as endoscopic and compound lifting approaches can improve the achievable results [33].

Conclusion

According to the main clinical studies selected in the present study, cervicofacial liposculpture proved to be safe and effective. In patients with loss of facial volume, high-density fat transfer with SVF-gel facial injection resulted in significantly higher improvement scores and better patient satisfaction, with an improved/much improved esthetic appearance being observed. As a follow-up analysis of the studies, at an average of six months after completion, most patients were satisfied with the results. Still, the results of the studies showed that the level of self-confidence and mental health-related quality of life can be significantly improved after facial lipofilling treatment.

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Conflict of interest
The authors declare no conflict of interest.

Similarity check
It was applied by Ithenticate@.

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