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Research Article

Non-surgical Jowl and Jawline Rejuvenation with Resorbable Suspension Threads and Superficial Enhanced Fluid Fat Injection (SEFFI)

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Abstract

Background: Collagen and elastin play a crucial role in skin traction; their deterioration contributes to causing skin sagging and laxity with time. Soft tissue ptosis modifies the mandibular profile in addition to enhancing the nasolabial folds, lines of puppets and lateral eyebrow area; moreover, skin atrophy and volume loss are major factors involved in facial aging, contributing to the formation of facial rhytids, skeletonization, and pseudo-descent of

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the midface. Non-surgical face and neck rejuvenation lift with resorbable suspension threads and Superficial Enhanced Fluid Fat Injection (SEFFI) can be used as a temporary procedure until the aging appearance requires a more radical approach.

Methods: Retrospective analysis from January 2019 to February 2022 of a 232 cases series of patients seeking a rejuvenation of the lower frame of the face (jowls and jawline) included in the study. The cases were performed in the base-office medical suites of some of the Authors. All of them were treated with resorbable threads in the face subcutis without modifying the superficial musculoaponeurotic system and platysma.

Result: Data collection on base-office medical suites treatment time, size and length selection, and post- treatment complications were included. The most frequent complication was bruise in the harvesting area (healed within 3-7 days) and in the jowl and jawline; cases of skin irregularities in threads (all cases solved 7-10 days); no skin irregularities or lumpiness in tissue graft.

Conclusion: Non-surgical face and neck treatment with resorbable suspension threads and Superficial Enhanced Fluid Fat Injection (SEFFI) getting a valid method as a temporary procedure until the aging appearance requires a more radical approach.

Keywords

Cervicoplasty; Neck; Rejuvenation; Aging; Mandible; Platysma Muscle; SEFFI; Regenerative Therapy; Stem Cells; SVF; Adscs; Jowl Treatment; Jawline Treatment

Introduction

Aging is a natural, genetic and biological event characterized by loss of soft tissue volume, tonicity and structural integrity, especially in the face; Facial aging results from a combination of soft tissue and bony changes, with bone loss in specific areas of the facial skeleton contributing significantly to the features of the aging face [1]. Early signs of facial aging affect the periocular region and include thinning of the eyebrows, deepening of the superior sulcus, development of infraorbital hollows, and atrophy of the midface [2-5]. Adipose Stem Cells (ASCs) are among the most investigated and used cells in the field of regenerative medicine. The Stromal Vascular Fraction (SVF) of the adipose tissue contains many cells composing interrelated cell populations: hADSCs (human Adipose Stem Cells) progenitors, pericytes, endothelial progenitor cells, and transit amplifying cells⁶. A lot of scientific works conducted on ASCs reported their capacity to differentiate into multiple cell types, including adipocytes, chondrocytes, myocytes, hepatocytes, endothelial cells both *in-vitro* and *in-vivo*. HADSCs display the ability to secrete bioactive molecules which stimulate angiogenesis and have antifibrotic, antiapoptotic and immunomodulatory properties [7-10]. Moreover, SVF/ ASCs

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induce the secretion of cytokine and growth factors which promote angiogenesis and thus re-vascularization of fat grafts [11,12]. Such characteristics of SVF/ASCs could account for some effects observed after adipose tissue implantation, such as improved skin trophism, accelerated closure of complex wounds or ulcers, and enhancement of skin appearance after damage from radiotherapy [13,14]. The transplantation of viable adipocytes and SVF/ASCs-enriched fat grafts, therefore, yields a combination of volumination and skin regeneration effects. Coleman standardized a procedure that uses the autologous fat tissue to restore volumes of the face; autologous adipose tissue was described as the ideal filler, delivering natural filling in a safe and easy procedure [15-19]. Many studies have demonstrated that an increased adipocyte engraftment and a more effective regenerative action can be obtained by injecting fat tissue and SVF/ASCs superficially (subdermal plane injection), and the smaller the adipose clusters injected, the better the results obtained [20,21]. Moreover, when small (0.2 to 0.8 mm) adipose tissue clusters are injected, the cellular blood irroration is improved along with the degree of engraftment. The group emphasized that when placing fat, it is imperative to maximize the surface area contact with surrounding tissue to ensure proximity of grafted fat with the vasculature of the recipient. Larger globules of fat undergo central necrosis, volume loss, and may result in oil cysts [22-24].

Suture procedures were first described in the 1980s, when nonabsorbable polypropylene threads became available. In the 1999, Sulamanidze and colleagues used subdermal “Aptos” thread product; spiral suture technique lift was published in 2002 with a formal clinical case. The Aptos sutures was at the beginning a multiple-dented suture for additional traction on tissue; the design was modified to be bidirectional, with the barbs oriented: soft tissues could be retained by threads suture without the need for anchoring at either end. It was then redesigned as a multiple-barbed polypropylene suture intended to provide traction and suspension unidirectionally [26,27]. In 2004, the US Food and Drug Administration (FDA) approved unidirectional barbed thread lifting (Contour Lift, Aptos Lift) for mid and lower facial rejuvenation [28,29]. Despite their revolutionary approach, these barbed sutures were permanent and caused many complications, infection and extrusion were common and they were very difficult to remove [30,31]. More recently, in April 2015, the FDA-approved by Poly-L-Lactic Acid (PLLA) and Glycoside-Polymer (PLGA) absorbable suture suspension for midface suspension [32,33].

The current combined technique between the Superficial Enhanced Fluid Fat Injection (SEFFI) and resorbable suspension threads is accurate and non-invasive, simple, addressing skin repositioning, volume restoring and tissue regeneration [34-40]. The procedure is carried out in a regular basic office and requires no surgical incision or skin sutures. It is speedy and effective, it takes about 20-30 minutes to insert 1 to 3 sutures for each side of the face. The technique is safe as no serious side effects have been recorded to date. The non- expanded SEFFI product shows a remarkably preserved Stromal Vascular Fraction (SVF) with slit-like capillaries wedged between adipocytes and stromal stalks with evident vascular lumina.

Material and Methods

We present a retrospective observational study of resorbable suspension threads procedure combined with SEFFI procedure performed with disposable all-in-one medical device SEFFILLER™ (produced by SEFFILINE srl Bologna Italy) in private medical facilities practice of some the the AA between January 2019 and February 2022: a total of 232 consecutive patients, 214 female and 15 male with mild and moderate laxity of lower face (jowls) according to the Facial Laxity Rating (FLR) Scale [18]. The youngest patient was 37 years old and the oldest was 72 years old with an average age of 43 years old All Patient received one 12 cm length thread per side in the jawline and an average of 3.5 ml per side (min 1.2 ml max 4.5 ml) of micro fragment adipose tissue in the jowl area with SEFFILINE technique and performed with SEFFILLER™ medical device. The study followed the ethical guidelines of the 1975 Declaration of Helsinki, and all patients signed informed consent prior to surgery, for their inclusion in the study and for the use of their images. Preoperative indications included patients with soft and moderate soft tissue ptosis. Patients were photographed according to indications by the FLR Scale.

The front of the face is positioned with the mentum, and forehead vertically aligned in an anatomically relaxed position. Suspenders threads lift implant selection was made by carefully palpating skin thickness, volume and tension at the midpoint and jowl area; it is essential to understand the path of the needle and its possible skin exits.

FLR scale was used to assess neck laxity aged related from 0 (no laxity) through to 9 (severe laxity) by the senior surgeons from both pre- and post-operative photographs. As the FLR scale evaluates four distinctive regions of the face and neck, for assessment purposes, we only considered the midface area, in particular at jawline area [34-44].

The big variability in thickness and quality of the cutaneous and subcutaneous tissue makes it extremely difficult to use a single type of autologous tissue preparation for injection, especially when considering the problems related to the superficiality of implantation, such as skin irregularities, and lumpiness.

First is necessary to understand where realize the skin traction; is strongly recommended to analyze the patient in a sitting position with the backrest straight. Midface area is palpated and lift with doctor open hand with fingers outstretched on it and direct towards the wrinkles to improve, for example the nasolabial folds, lines of puppets and lateral eyebrow area; the ends of fingers report the first idea of resorbable suspension threads. After several lift tests, finger directions are converted to a one entry point in the opposite palm hand area near the patient's cheekbone. The aesthetic results that can be obtained with this technique in midface area consist in tissue retraction and repositioning of the cheeks, increase of the zygomatic projection and in particular the redefinition of the mandibular profile.

This maneuver not only allows us to decide the position and direction of the threads, but it is also a way to assess whether the patient has the correct indication for treatment: in fact, if our traction does not produce visible results in the caudal region or produces an excessive amount

of skin in the cranial part, the patient will not obtain satisfactory results. The lack of effect in the caudal part is typical of faces with marked adipose panniculus both in the malar region and in the anterior cervical region. While, the excess of cranial skin due to the traction of the fingers is typical of very thin faces in which the adipose panniculus is poorly represented and the skin will tend to appear ptotic. Both of these types of patients are not suitable candidates for treatment.

Secondo step is to draw the path of the thread on the skin; it is used a regular demographic pen or a skin graphic pencil. The 4 Midface area points are identified by 2 nasolabial fold points and 2 jowl area points: the lowest nasolabial fold point it is identified towards the corner of the mouth while the highest nasolabial fold is marked towards the nostril of the nose.

Prophylactic antibiotic therapy with third-generation cephalosporin was administered 20 minutes before the treatment orally. Non-surgical resorbable suspension threads treatment time ranged from 15 minutes to 20 minutes (median 13 minutes) confirming that this technique is very fast. No side effects have been recorded to date; there was only the appearance of slight bruising lasting about a week and the presence of edema in the two days following the treatment. Any eventual skin depression at the entry point tends to disappear after a few days. Aesthetic results are immediately considerable after the treatment improving further over time and can last up to 12 months.

Superficial Enhanced Fluid Fat Injection (SEFFI) was performed with the SEFFILLER™ medical device (Produced by SEFFILINE srl - Bologna - Italy); it is a CE-marked medical device to perform autologous regenerative treatments in surgery in a safe, standardized, easy and effective way. The device allows to harvest micro-fragmented adipose tissue in very small clusters naturally containing the Stromal Vascular Fraction cells (SVF) component and Adipose Derived Stem Cells (ADSCs).

All the components needed for treatment are presented in Fig. 1. The device includes one harvesting cannula (15 cm in length, 2 mm in diameter), provided at its tip with 15 side portholes of 0.8 mm that harvests small clusters of adipose tissue. The device also includes one patented guide for harvesting the adipose tissue in the subcutaneous superficial plane subcutaneous tissue, containing more SVF cells and ADSC (Table 1) [48,49].

The guide provides safe and standardized harvesting of the subcutaneous tissue even by a physician without liposuction skills (Fig. 1).

Patient Demographics	All patient n= 232
Age (years)	
30-39	14
40-49	42
50-59	89
60-69	71
70-79	16
Sex	
Female	214
Male	18
Smokers	
Smokers	70
Non smokers	162

Table 1: Patient demographics (232 patients).



Figure 1: SEFFILLER™ medical device special guide provides and standardized harvesting of fat tissue.

Adipose Tissue Harvesting

The procedure was performed under local anesthesia. Lidocaine has no negative impact on the distribution, cell number, and viability of ASCs and preadipocytes 45. Briefly, adipose tissue was harvested from the abdomen or the proterokinetic region. Manual aspiration of the fat tissue was performed with a 10 ml syringe with plunger lock mounted with the microperforated side-port cannula inserted into the patented guide. The adipose tissue's aspiration was performed by proceeding to a gentle back-and-forth fan movement throughout the sampling

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area. The guide guaranteed that the tunneling was carried out in the subcutaneous tissue adjacent to the dermis, in the Superficial Adipose Tissue (SAT) (Fig. 2).

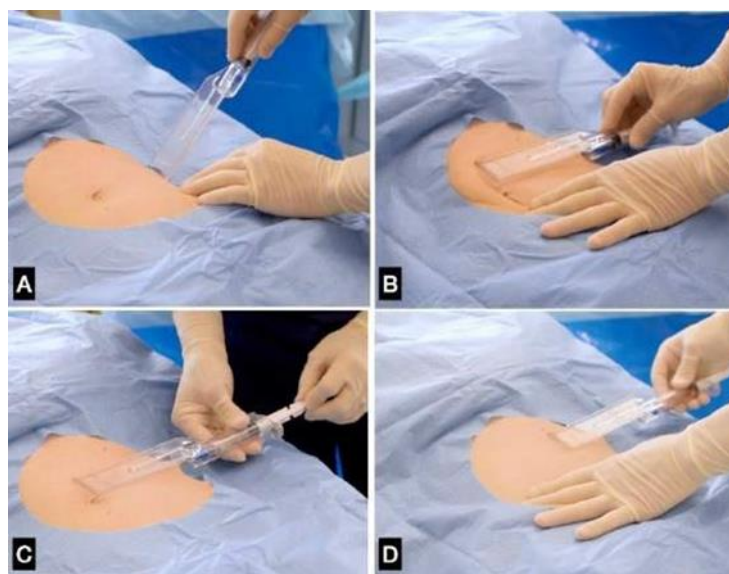


Figure 2: A) Introduction of the cannula; B) standardized harvesting procedure: 15 mm under the skin; C) syringe plunger locked for tissue harvesting; D) harvested tissue.

The aspiration ended after the collection of 5 ml of tissue. The harvested tissue was rinsed with saline solution and maintained in a vertical position for a few minutes to let the content stratify by the force of gravity in two layers (Fig. 3).

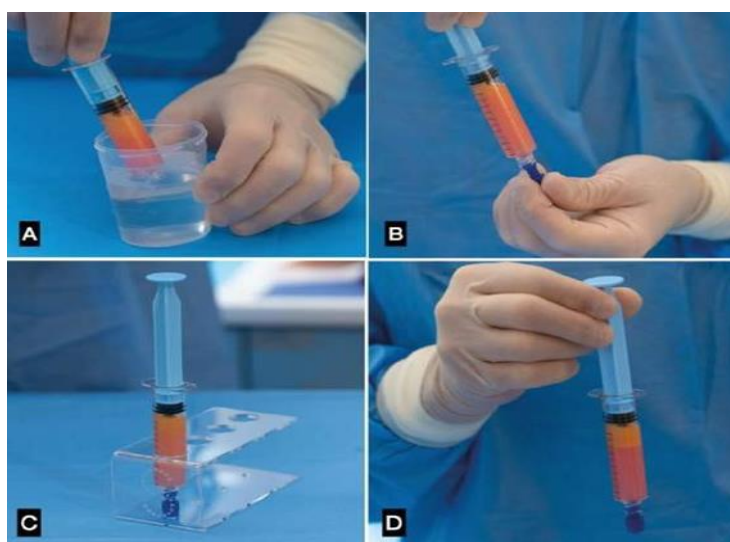


Figure 3: A) Harvesting tissue is rinsed with saline solution; B) Close the syringe with a lure-lock cap. C) Harvesting syringe is maintained in a vertical position; D) Harvested tissue.

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After the aspiration syringe the tissue is transfer into a lure-lock 10 ml. The harvested tissue was rinsed with saline solution and maintained in a vertical position for a few minutes to let the content stratify by the force of gravity in two layers (Fig. 4).

After few minutes the washing liquid was discharged and the tissue is ready to be prepared for the injection. The face areas have different skin and subcutaneous thickness hence is important to inject the right fluidity of the tissue in order to inject it superficially without any risk of visibility and lumpiness.

In order to obtain different degrees of fluidity it's possible to reduce further the clusters dimension; with SEFFI technique it's possible to achieve this further clusters reduction with an emulsification procedure. We connect the two syringes of 10 ml through transfer provided in the device and perform some passages of the tissue from one syringe to the other following the chart (Fig. 5,6).



Figure 4: The emulsification, in this study we injected tissue composed by an average of 600-micron cell clusters superficially in the jowl area using a microcannula 20G 5 cm. To obtain this fluidity, we performed three passages of emulsification according to the chart.

		
0	800 micron	18G -inner diameter 0.83mm
2-3	600 micron	20G -inner diameter 0.60mm
5-6	500 micron	21G -inner diameter 0.51mm
10-11	400 micron	22G -inner diameter 0.41mm
20-30	200 micron	27G -inner diameter 0.21mm

Figure 5: The cluster size after different manual emulsification procedure.



Figure 6: A: Chin single entry point; B: Jowl area of injection; C: Tissue injection in the superficial subcutaneous plane.

The fresh micro fragmented adipose tissue obtained with SEFFI technique doesn't need any further substantial manipulation due to the small dimension of harvested clusters with the SEFFI cannula with 0.8 mm side port holes; the only light manipulation (passaging from one syringe to another) should be performed in case of needs increasing fluidity to treat very delicate areas of the face. Study proved that any substantial manipulation, aggressive harvesting, and ambient air exposure reduce the viability and stemness of tissue [50]. The SEFFI procedure performed SEFFILLER™ device involves delicate guided tissue harvesting with 10 ml syringe, washing the tissue with decantation, no substantial manipulation and with a minimal ambient air exposure: study proved that this procedure leads a tissue rich in viable cells in T0 and a good growth rate at T72 even comparing with other devices [51,52].

Homogeneous MSCs (Mesenchymal Stem Cells) population and can be involved in loss of volume, restoration, enhancement, and skin appearance aging of human face; in particular SEFFI works on reduction of superficial facial wrinkles [37-40].

The resorbable suspension threads treatment can be performed in local anesthesia (only the needle entry and exit points). The patient position is supine over the table with slightly raised back. Prior to skin incision with 18G needle, infiltrations of lidocaine and epinephrine are performed: by 30G needle along the entry point with epinephrine 1:200,000; infiltration technique is performed by palpating the skin with index and thumb and inserting the 31G needle with 45° inclined direction to the skin; this element is essential to create anesthetic idrodissection tissue entry point and find the correct plan for resorbable suspension threads needle: this procedure is of paramount importance for the upcoming treatment. It is practiced anesthetic injection at the entry point (0,5cc) and at all exit points (0,25cc each). It is not necessary to administer other local anesthesia in the journey between the point of entry and exit since the technique is not painful. Incorrect positioning of the resorbable suspension threads sutures at the superficial dermal or deep muscle level could cause pain during insertion and make the treatment ineffective. After scrubbing the skin (chlorhexidine and alcohol solution is preferred) and draping with a sterile gauze, skin incision is made with a 18G needle,

held vertically, in the subcutaneous tissue with depth of about 5 mm. The 12 cm resorbable suspension threads needle is made to enter vertically for the same depth and once reached this plane is inclined about 90° to scroll in subcutaneous plane. The resorbable suspension threads needle is pushed from the entry point into a subcutaneous tunnel at the same depth towards the exit point. In clinical cases where the skin is particularly thick, such as in Asian faces, the tip of the needle must be inserted more deeply to avoid inserting the suture too superficially. The needle is recovered and pulled when it pierces the skin, so resorbable threads cones can fill all subcutaneous tunnel. The technique is repeated from the same entry point for the other resorbable suspension threads needles. It must be remembered that the cones are oriented with their vertex in the same direction of the needle for single threads. The bidirectional resorbable suspension threads present the median union point smooth without any cone. The skin is pulled with massage upwards and backwards to feel the anchor cones “clips” in subcutaneous plane. The tissues are unable to return to their original position when the manual compression is released because they will be anchored by the thread’s base cones. It’s important to not cut suspension threads gone out from the skin until the second side is also finished, in order to check symmetry with the patient sitting in the front position. At the end of the procedure, sutures that protrude from the skin are cut by exerting light pressure with the tip of the scissors, so the end suspension threads part remains properly inserted in the subcutaneous plane (Fig. 7,8).

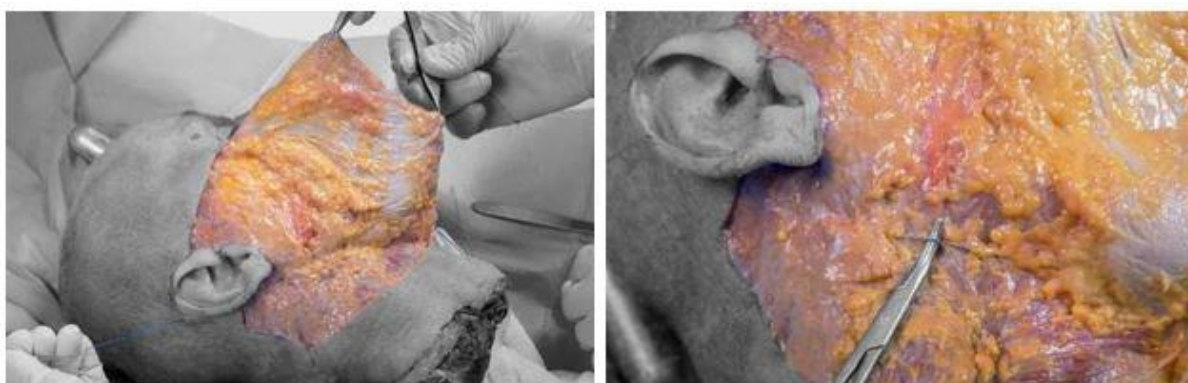


Figure 7: The 12 cm resorbable thread lift needle is passed a first time at the retroauricular space: the entry point is performed behind the auricle. The subcutaneous tunnel is directed to jawline district.

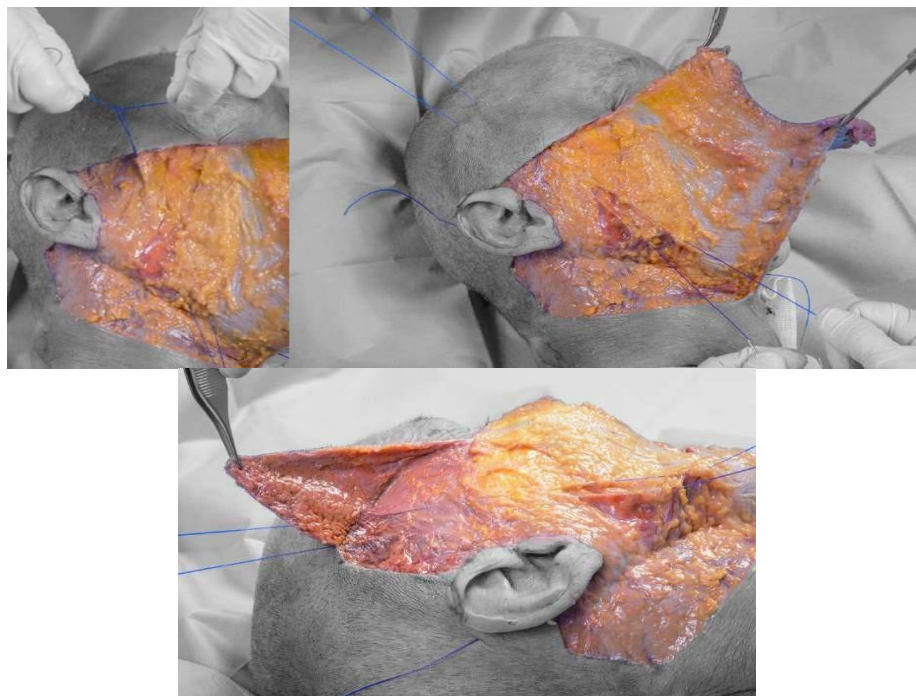


Figure 8: The 12 cm resorbable thread lift needle is passed a first time at the zygomatic subcutaneous entry point to perform the tunnel to jawline area. Two bidirectional thread lift are crossed at the entry point and the second thread lift is directed to temporal area to perform additional upward traction.

Result

Suspension threads lift treatment it is a totally safe and absorbable treatment although it could present depression entry point and skin irregularities at the immediate post-treatment; this post care complication heal on their own in the days after treatment. Resorbable suspension threads are invisible in every position of the midface, eyes and neck regions and almost impalpable, giving no clues that the treatment was performed. The results are stable after 30/45 days and improve over time and after about 3/4 months they reach the maximum effect and will last for about 8-12 months. They can be integrated with any other type of aesthetic treatment. Monopolar radiofrequency is not recommended (during the first six months after the insertion of the sutures), as it could accelerate the resorption of the sutures themselves.

However, complications due to threads insertion errors lead to possible entry point depression, skin irregularities, skin folds, pain, edema. All complication is transient and usually resolve without treatment from the first to the third weeks maximum. Unpredictable reactions concern the appearance of bruises or hematomas, or infection: these have a very low and close to zero degree of incidence; instead, asymmetric lifts are more common, also because one side is very initially different than the other.

In our study we treated our patient before with the SEFFI injection in the jowl area (Fig. 9) and after, but in the same session, we inserted the threads in the jawline. We avoided to treat in the same session the same area with tissue graft and threads.

The rationale that leads to combine SEFFI technique and threads is based on the correction of the main face aging factors: loss of volume, aging of the skin and descent of tissue; SEFFI technique, grafting micro fragmented adipose tissue rich in SVF and ADSCs leads the correction of loss of volume and aging of the skin, while the positioning of threads leads the correction of the descent of tissue. The combination of these two medical procedures achieved very satisfying results for Patients and Doctors (Fig. 9-12 and Table 2-4).



Figure 9: Result in a female patient at months.

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Figure 10: Result in a 54 yrs old female patient: A. PRE front view, B. POST 2 months; C. PRE left side, D. POST 2 months; E PRE right side, F. POST 2 months.



Figure 11: Result in a 49 yrs old female patient: A; PRE B. immediate POST; C. 1 week POST; D 4months POST.



Figure 12: Result in a 47 yrs old female patient: A. PRE front view, B. POST 6 months; C. PRE left side, D. POST 6 months; E PRE right side, F. POST 6 months.

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Table 1 FLR scale evaluation of four distinctive regions of the face and neck

FLR scale	Class	Facial compartments (distinctive signs)			
		Upper face (eyelid fold)	Middle face (nasojugal fold)	Lower face (jowls)	Neck (neck angle)
No laxity	0	Absent	Absent	Absent	Acute angle
Mild laxity	1	Perceivable	Perceivable	Perceivable forward, absent downward	Acute semi-straight angle
	2	Well defined	Perceived as an indentation	Defined forward, absent downward	Straight angle
	3	Partially folding	One quarter into cheekbone	Defined forward, perceivable downward	Straight angle interrupted by convexity
Moderate laxity	4	Folding	One half into cheekbone	Defined forward and downward	Straight angle interrupted by convexity + submental sagging
	5	Well-defined eyelid fold, still separated from eyelid border	Three quarters across cheekbone	Protruding forward, defined downward	Submental sagging + 45° interruption of neck angle
	6	Partially on eyelid border	Crosses cheekbone	Protruding forward and downward	Multiple areas of submental sagging
Severe laxity	7	Completely on eyelid border	Divided	Protruding forward, sagging downward	Complete submental sagging, concave angle
	8	Pushing eyelid border downwards	Flattened	Sagging forward and downward	Complete submental sagging, 45° straight angle
	9	Interfering with pupil	Pulling down lower eyelid	Sagging forward, mixed downward with the neck	Complete submental sagging, convex angle

Table 2: Face laxity.

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Postoperative complications in numbers	
Depression entry point	72
Skin irregularities (> 20 days)	31
Pain	34
Prolonged Edema (> 5 days)	16
Early (first 24h) hematoma	59
Late hematoma	34
Prolonged erythema (>48h)	0
Skin necrosis	0
Fat necrosis	0
Teleangiectasias	0
Infection	0

Table 3: Donor site complications.

Postoperative complications in numbers	
Depression entry point	81
Skin irregularities (> 48h)	67
Pain	76
Prolonged edema (> 5 days)	9
Early (first 24h) hematoma	59
Late hematoma	37
Prolonged erythema (>48h)	0
Blindness	0
Infection	0

Table 4: Injection area complications.

Conclusion

The three main factors involved in facial aging are the aging of the skin, loss of volume and descent of tissue. Many surgical procedures are addressed to correct these factors with very good and lasting result. Surgical procedures are the right indication for the advanced-moderate and severe face laxity (FLR scale 6 to 9). In Surgical procedures gives great and long-lasting results despite longer postoperative downtime and higher rate of complications comparison with medical treatments. In the light of these evidence AA propose a combination of two medical treatments (SEFFILLER and threads) to rejuvenate the inferior third of the face in mild to moderate face laxity (FLR scale 1 to 5).

The non-expanded and ready-to-use SEFFI product obtained with SEFFILLER™ medical device perform a refinement of the current fat harvesting procedures, through the harvesting of smoother and fine autologous fat tissue by means of a microcannula with extremely small ports,

ideal and suitable for the face dermis and sub dermis anatomic areas without requiring further tissue manipulation. SEFFILLER™ tissue product represents a refinement of the current fat harvesting procedures, through the smoother harvesting fat tissue by means of a guided micro-cannula with extremely small ports, for the treatment of dermis and sub dermis regions: high level reduced risk for lumpiness after superficial injection, promises volume enhancement and provide an high degrees of cellularity and fluidity represent an ideal technique for skin rejuvenation procedures: hADSCs and SVF (with pericytes and hMSCs) are the most promising elements for skin facial rejuvenation. In addition, the positioning of threads is the medical procedure addressed to repositioning the skin following the anti-gravitational vectors then to correct the descent of tissue. The combination of these medical techniques is promising medical treatments of mild to moderate facial laxity with a fast recovery and very low complications rate.

Conflict of Interest

The authors declare that they have no conflict of interest.

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