

Research Article

Outcome of Thread Lifting Technique for the Face using Absorbable Barbed Polydioxanone Threads: Innovative Score for Objective and Subjective Assessment

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Abstract

Background: Thread lifting rejuvenation procedures are re-evolved again, after developing absorbable threads, with very popular spread among plastic surgeons and dermatologists. This study evaluates two years' outcome of absorbable barbed thread lifting for face and suppose methods for assessment.

Material and Methods: Prospective comparative study both objectively and subjectively is designed for 24 months follow up.

Results: Thread lifting for face has significant long-lasting considerable skin lifting from 3-10mm and high degree of patients' satisfaction with rate of complications of about 4.8%. Augmented results are obtained when threads were combined with other lifting and rejuvenation modalities

Conclusion: Significant facial rejuvenations are got by thread lifting and highly augmented results when they are combined with Botox, fillers and/or platelet rich plasma rejuvenations.

Introduction

Aging is an inevitable and progressive process, and the face is the mirror of total body aging. Aging in the face is affecting all facial layers, [1] skin, subcutaneous fat, sub-facial musculoaponeurotic system SMAS, deep fascia, the retaining ligaments, neuro-facial muscles activity and even the facial bonny skeleton. Variable procedures for facial rejuvenation have innovating through surgical and non-surgical techniques, according to the degree of tissue laxity, surgeon assessment and patient preference. The most common non-surgical tools for face rejuvenation are the dermal fillers, Botox, peeling, laser resurfacing, platelets rich plasma (PRP), and threads' lifting. Thread lifting has long history [2] and debate because of previously high record of complications of non-absorbable threads, when approved in 2005 by FDA, [3] then has lost approval years later. With the introducing of absorbable threads, made of polydioxanone (PDO), thread lifting has got interest and popularity

again with diversity of manufacturing companies which are producing many types with many indications either for rejuvenation and / or skin lifting. Thread lifting is neither alternative to surgery, nor magic per say, but it could have good effect for rejuvenation, and skin lifting, especially when combined with another method of facial rejuvenation. Many histopathological studies have indicated dermal and subcutaneous foreign body reaction, after inserting the thread, in form of lymphocytes infiltration, collagen deposition and fibrosis [4,5]. The fibrosis process is followed by fibrous tissue contracture and traction on the skin and results in skin tightening [6]. Thread lifting gets both patients' and physicians' attention, because it is minimal invasive, fast procedure and it underwent at an outpatient clinic. This study is designed to assess barbed thread lifting outcomes alone and in combination with another method of facial rejuvenation. Assessment is carried out regarding complications, degree of lifting, and patient satisfaction.

Patient and methods

Prospective comparative study was designed to include 63 patients and divided into 3 groups of 21. First group submitted to facial rejuvenation by thread lifting only. Second group was managed by combining thread lifting once and with other rejuvenation procedures such as fillers, Botox or platelet rich plasma (PRP) every 6 months. Third group was submitted to triple facial rejuvenations by fillers, Botox and plasma for protocol lasting only 6 months without thread. This study was designed to evaluate three components in each group; complications throughout the follow up period, degree of skin lifting in millimeters using lifting score and patient satisfaction throughout the 24 follow up months.

The following complications were evaluated in each group early after the procedure and throughout the follow up period: asymmetry, thread breakage, hypersensitivity, edema, hematoma, seroma, persistent rippling and puckering, palpability, infection, granuloma, skin erosion, upper eye lid ptosis, nerve injury, sensory impairment. Innovated score was designed and named Helmy's score for objective assessment of the degree of skin lifting. Score measures the degree of skin lifting, from zero to four, when zero means no lifting, one means minimal lifting ranges from 1-2mm, two means moderate lifting from 3-6mm, three means considerable lifting more than 6mm-1cm, and four means sensational skin lifting more than 1cm (Table 1).

Degree of skin lifting in mm	score	Description
0	0	No lifting
1 - 2	1	minimal
3 - 6	2	moderate
> 6- 10	3	considerable
> 10	4	Sensational

Table 1: Helmy's score for objective assessment of the degree of facial skin lifting by threads.

Objective assessment is carried out by measuring certain lines drawn from fixed anatomical landmarks to certain points at upper, mid and lower face, at each step of follow up (Figure 1).



Figure 1: lines of measuring. Line1 is drawn from end of eyebrow to the hair line. Line2 is drawn from the tragus to the midpoint of nasolabial fold. Line 3 is drawn from the tragus to the midpoint of marionette line.

These lines are measuring the degree of skin re-draping after thread lifting. At the upper face, I had measured line drawn from end of eyebrow to the hair line. At mid face, the measured line is a line drawn from the tragus to the midpoint of nasolabial fold. At the lower face, measured line is drawn from the tragus to the midpoint of marionette line. These lines are measured by millimeters graduated ruler (Figure 2).



Figure 2: lines are measured by graduated ruler in millimeters.

Then clinical overall observation of the face is assessed as regarding the heights of lateral eye brows, nasolabial angle, check mandibular groove, checks' contouring, prominence of jowls, marionette lines deepening and overall jaw lines curvature (Nephritis' curvature). Subjective assessment of patient satisfaction by (Helmy's satisfaction score). Score was designed by questionnaire also from zero to four, when zero means dissatisfied, one means minimal satisfaction, two means moderate satisfaction and three means high satisfaction and four equals full satisfaction (Table 2).

score	Description
0	Dissatisfied
1	less satisfied
2	Moderate satisfied
3	Highly satisfied
4	Fully satisfied

Table 2: Helmy's score for subjective patient satisfaction after face lift by threads.

Collected aesthetic outcome data were submitted for statistical analysis for the three groups by using two-tailed t test with calculation of standard deviation and p value consideration of significance at set at $P \leq .05$

Threads were used in this study to lift facial skin laxity, exactly; to elevate lateral eye brow and to pull the crease over front nasal angle, in upper face. Thread was used in the mid face to augment checks contour, recreate the checks mandibular groove, and to shallow the nasolabial folds. Threads in lower face, were used to eliminate the sagging of jowls and marionette lines.

Threads description and technique

Threads used in this study were, absorbable PDO, barbed, 4D, 21-gauge with 60 mm length for check lifting, 19-gauge with

90 mm length or 18-gauge with 100 mm length for Jowls and mandibular edge lifting, according to degree of skin sagging, texture, and thickness. Each thread is packed separately, inside blunt cannula and sterilized by EO gas.

Steps of technique

- Technique was performed as an outpatient procedure, under aseptic condition.
- Local anesthesia infiltration at site of entry and along the proposed thread line, in multiple infiltration sites with 1.5-2cm apart between each site of injection. The amount of anesthetic solution in each injection ranged from 2-5 ml of mepivacaine HCL 2% diluted with 1:20000 levonordefrin solutions.
- Thread was introduced after skin puncture by 18-gauge Trocar, at hair line, then cannula containing the thread was hold perpendicular to the skin till passing the dermis, then it was repositioned in parallel to the face to pass in subcutaneous plan superficial to facia. It was continued above the SMAS to be away from facial nerve by two layers which are; the SMAS and superficial layer of superficial temporal fascia.
- Thread cannulation was stopped, 3mm-6mm before any proposed crease e.g. the nasolabial crease, marionette line. Surgeon or physician should take care, because if the tip of the cannula, passes the proposed crease, so cannula's side hole opening will be inside the crease, therefore thread will make traction on the crease, and the result will deep it more instead of its shallowing.
- External part of the cannula was rolled by the dominant hand and genital pressure over the skin was done by the other hand to anchor the barbed thread inside the tissues.
- Cannula was withdrawn leaving the thread inside the track.
- All other threads were inserted through the proposed subcutaneous track on both sides of the face.
- Genital traction force was applied bilaterally, on the corresponding threads at each side, when patient is lying down or in sitting position.
- Finally cutting the extra length is done while scissor is forcing against the opening, in order to avoid major skin irritation.
- Small pieces of Steri-strips were put to reinforce skin puncture closure and to do some fixation. Post procedure instructions were given to the patients to; avoid facial massage, limit facial muscle over activity for 24 hours, soft diet in the first 3 days, sleeping on the back for first weak and analgesia or anti-

edematous tablets are prescribed only when required. No any antibiotic was prescribed for any patients.

Hyaluronic FDA approved fillers were used to fill the temples, correct frontonasal angles, nasal dorsum, nasal sides irregularities, nasal tip definition, nasolabial angles, the marionette line and the jaw borders depression.

FDA approved botulinum toxins was used only to rejuvenate forehead creases, crew's feet and nasals muscle over activity and it used to weak the hypertrophied masseter muscle so, the mandibular angles define more. Plasma (PRP) were applied by 5 sessions protocol at first year with one month apart and two sessions at the second year as maintenance.

Study was conducted between October 2014 till January 2017 mostly at the private practice. Full patient history and examination are carried out before the procedure. Informed consent for the study and photography by same focal length, identical background with standard views were obtained from each patient. From 63 cases seeking for facial rejuvenation, 55 were females aged between 35-50 years old with average 40years old, and 8 males aged from 45 to 55years old. All patients are Baker I -II classification for facial aging rhytidectomy, and number of threads used in each side of the face was from 2-5.

Exclusion criteria were; Bleeding disorders, chronic diseases, immunologic, or healing disorders, facial bonny defects, cases of facial nerve injury, hereditary facial atrophy, patients underwent previous face lifting or facial surgery or submitted before inclusion in the study for any other type of thread lifting. Ethical Committee of Al-Azhar university was approved the study.

Results

Thread lifting was undergoing in two groups of the study, on total 42 subjects. It was done alone for face lifting in group 1 containing 21 patients, and were combined with another rejuvenation procedures in group2. In group3, Patients were submitted to triple facial rejuvenations by fillers, Botox and plasma in 21 cases. Outcome complications in all groups of the study were almost near each other, resembling 1/ 21 in each group, nearly about 4.8%. One case from 21 cases who were submitted for thread lifting alone, was complicated by, thread breakage and loss of it is potential anchoring. In Group2 patients who were submitted for combined thread lifting and rejuvenation, palpability of the thread was reported in one case and continued after 2 weeks up to one month. In group3 patients who were submitted for triple facial rejuvenations, one case of injected filler to the nose was complicated by infection, and superficial skin erosion (Figure 3).

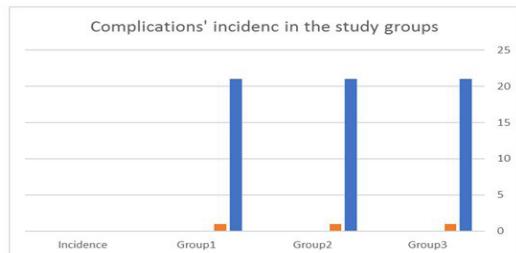


Figure 3: Chart shows Complications' incidence in the study groups. Outcome complications in all groups of the study were almost near each other, resembling 1 / 21 in each group, nearly about 4.8%. Complications were in group 1: thread breakage, in group 2: palpability and in group 3: infection.

Score for degree of skin lifting, shows highest degree of skin lifting, immediately, after 3, 6, 12 and 24 months follow up, in group 2 when compared with other two groups (Table 3) (Figure 4).

Lifting score (Helmy's score)	Group1 21	Group2 21	Group3 21
Immediate			
No lifting			
1(1-2mm)			
2 (3-6mm)			
3(>6-10mm)	17	21	
4(>1cm)	4		
At 3 months			
No lifting			
1(1-2mm)			
2 (3-6mm)			
3(>6-10mm)	21	16	5
4(>1cm)		5	16
At 6 months			
No lifting			
1(1-2mm)			
2 (3-6mm)			
3(>6-10mm)	21	20	21
4(>1cm)		1	
At 1 year			
0 No lifting			
1(1-2mm)	20	14	21
2 (3-6mm)	1	6	
3(>6-10mm)	0	1	
4(>1cm)			
At 2years			
0 No lifting			
1(1-2mm)	2	15	21
2 (3-6mm)	12	5	
3(>6-10mm)	7	1	
4(>1cm)			

Table 3: Score results after thread lifting. It shows gradual decrease in the degree of skin lifting by time. Group 2 shows the least re-sagging when it is compared with other groups.

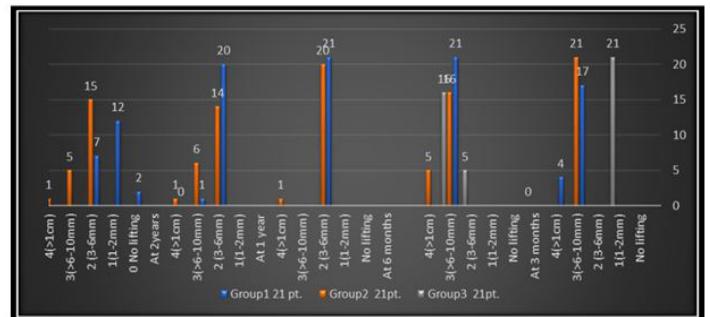


Figure 4: Chart shows Lifting score results in the study groups.

Score for degree of patient satisfaction, (Table 4) and (Figure 5-11) are showing the highest degree of satisfaction, in group 2 when 100% of patients in group 2 were immediately highly satisfied after the procedure, this percentage showed 24% of the highly satisfied upgraded to fully satisfied at 3months, and 95% continued highly satisfied at 6 months. After one year 71.5% of the patients in group 2 were moderately satisfied, 12.5% highly satisfied and 12.5% continued fully satisfied. After two years follow up, 43% of the patients in group 2 were moderately satisfied, 43% highly satisfied and 14% got fully satisfied.

Satisfaction score (Helmy's score)	Group1 21 pt.	Group1 21 pt.	Group3 21pt
Immediate			
1 (less satisfied)			
2 (Moderate satisfied)			
3 (Highly satisfied)			
4 (Fully satisfied)	17 4	21	21/21
At 3 months			
1 (less satisfied)			
2 (Moderate satisfied)			
3 (Highly satisfied)			
4 (Fully satisfied)	21	16 5	15 2
At 6 months			
0 (Dissatisfied)			
1 (less satisfied)			
2 (Moderate satisfied)			
3 (Highly satisfied)			
4 (Fully satisfied)	21 0	20 1	21
At 1 year			
0 (Dissatisfied)			
1 (less satisfied)			
2 (Moderate satisfied)			
3 (Highly satisfied)			
4 (Fully satisfied)	21	15 3	21 3

At 2 year			
0 (Dissatisfied)	3		
1 (less satisfied)	8		
2 (Moderate satisfied)	10	9	
3 (Highly satisfied)	0	9	
4 (Fully satisfied)	0	3	
			21

Table 4: Patient satisfaction score results after facial thread lifting.

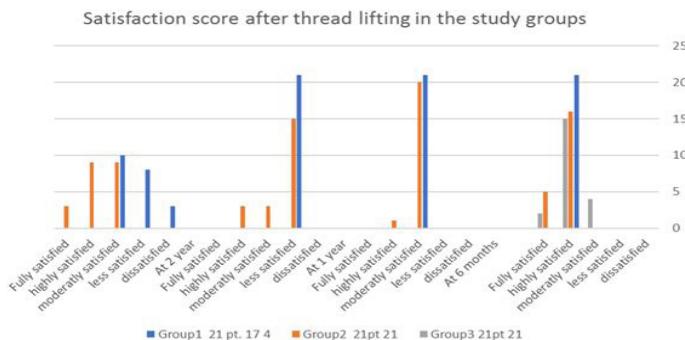


Figure 5: Chart shows Satisfaction score after thread lifting in the study groups.

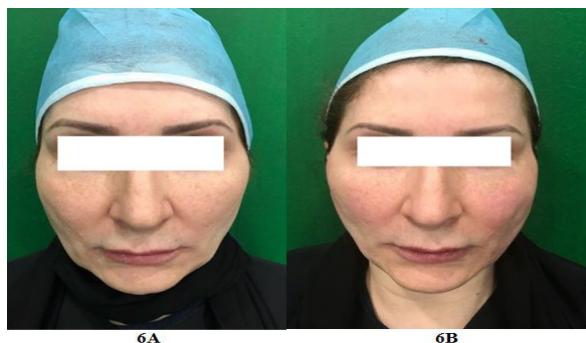


Figure 6A: 50 years old female patient submitted for barbed thread lifting only with considerable skin lifting about 10mm and immediate high patient satisfaction. Pre-thread photo frontal view. **6B:** Immediate post-thread lifting results front view.



Figure 7A: 55 years old male patient submitted for barbed thread lifting alone. Pre-thread lifting photo lateral view. 7B: 3 months' post-thread lifting lateral view. Considerable lifting about 9 mm with high patient satisfaction.



Figure 8A: 55 years old female patient submitted for barbed thread lifting and PRP rejuvenation. Pre-thread lifting photo front view. **8B:** 6 months' post-thread lifting front view. Considerable lifting about 8 mm with high patient satisfaction.

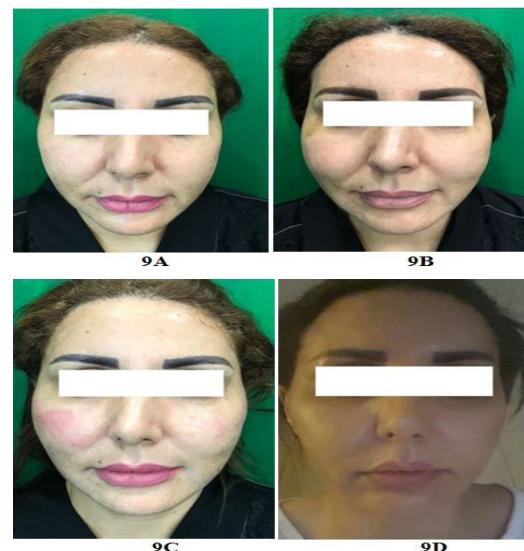


Figure 9A: 42 years old female patient submitted for barbed thread lifting, which has augmented by fillers and Botox. **9B:** 3 months' Post- thread lifting front view. **9C:** 6 months' Post-thread lifting and immediate after re-filler and re-Botox. front view. **9D:** 1 year post-thread lifting lateral view. Sensational lifting more than 10 mm with high patient satisfaction.



Figure 10A: 52 years old female patient submitted for barbed thread lifting with filler and PRP rejuvenations. Pre-thread lifting photo frontal view. **10B:** 2years post-thread lifting front view. Moderate skin lifting about 4 mm with moderate patient satisfaction at 2 years.



Figure 11A: 50 years old female patient submitted for barbed thread lifting alone with sensational lifting and high satisfaction at 2years. Pre-thread lifting photo frontal view. **11B:** Post 2years thread lifting front view. **11C:** Pre-thread lifting lateral view. **11D:** 2years post-thread lifting lateral view

Discussion

Worldwide concept, about minimal or less invasive facial rejuvenations, has adopted high popularity among physicians and clients who are seeking for facial skin lifting and rejuvenation [4-7]. Histopathological evidence of collagen stimulation and fibrosis [4] formation have been studied and confirmed, however no many reports are available, about histology for long time follow up. Collagen is initiated then formed around the thread and its cogs or barbs and induces more effect [8,9].

Studies [10,11] which done before and published by many authors [12,13] has focused on methods and complications mainly [14], and it was recommended by some authors as Shimizu Yuki and Kane Terase [4] from Japan, to do long term observation and assessment. Outcome complications in all groups of the study were almost near each other, resembling 1/ 21 in each group, nearly about 4.8%.

One case from 21 cases who were submitted for thread lifting alone, was complicated by, thread breakage and loss of it is potential anchoring and this could be attributed to technical error from the surgeon when he missed the plane and being superficial in dermis, then he tried to re-direct in subcutaneous plane, so thread broken then was withdrawn out. Nearly all patients submitted for thread lifting complained edema or bruises for 3-5 days, which were self-limited and required no treatment, but no any record of edema continuation after this period.

In Group2 patients who were submitted for combined thread lifting and another rejuvenation, palpability of the thread was reported in one case and continued after 2 weeks up to one month with subcutaneous feeling pain and pricking of barbed thread, re-

sembling about 4.8% incidence in this group. In group 3 patients who were submitted for triple facial rejuvenations, one case of injected filler to the nose was complicated by infection, and superficial skin erosion

This study included long-term follow up, for 2 years after threads insertion, and has evaluated the degrees of face lifting objectively by innovative score and providing subjective evaluation of the patient's satisfaction through questionnaire, and it has taken care by the recording of any complication.

Throughout this study, during the two years of follow up, complications were reported in 3 cases of 63 cases who are total patients in all groups. when one case showed, thread breaking, one showed palpability in thread lifting groups, and one showed infection in triple rejuvenation group. All complications resemble 4.8%, but no incidence of asymmetry, infection, edema, granuloma, [11] seroma, and hematoma [12-14]. This may be explained as threads in this study were inserted by blunt cannula not a sharp needle. No nerve damage, upper eye lid ptosis, persistent rippling and puckering, skin erosion, sensory impairment or hypersensitivity or chronic pain were reported in this study as it has reporting by other studies [13].

In previous two studies were conducted about thread lifting techniques, one was carried out by Abraham [16] about use of thread lifting combined with radiofrequency and micro needling for treatment of superficial rhytids, it has showed good results, and one article has published by Sarah Tonks, [4] titled, understanding thread lifting, has supposed the use of thread lifting could be conjugated with other treatment modalities to augment the aesthetic outcome and best effects. Both studies are coming with my findings.

This study shows a significant outcome of thread lifting and sustained results are extending beyond one year and are continuing till two years, in both groups where threads were used. Our results showing that; facial skin lifting and rejuvenations were achieved by threads throughout the 24 follow up months, but the results are showing gradual decrease in the degree of skin lifting by time. So, further studies are required to assess the longevity beyond 2 years. Study shows also a potent effect of Botox for lifting and rejuvenation of forehead and fillers for nasolabial lines, marionette lines, nasal, facial, mandibular angles and other lines by dermal filling and lifting, but their effects are temporary and limited till 6 months. Botox still has unique results for forehead lifting.

In the study group 2, when threads were combined with other modalities; either Botox, filler or plasma, 100 % of the group populations immediately were showed more than 6-10 mm skin lifting immediately, when threads were combined with filler or PRP and 10 days after the procedure when were combined with Botox. At 3 months, skin lifting in group 2, was in average from 3-6 mm in 76% of patients and sensational skin lifting more than 1cm in

24% the group. While at 6 months measuring of skin lifting, has recorded 95.2% showed considerable >6-10mm lifting of the skin and 4.8 showed sensational lifting >1cm. At 1 year, measuring of skin lifting, has recorded 66.6% showed 3-6mm, 28.5 showed >6-10mm, considerable lifting and 4.8 showed sensational lifting more than 1 cm.

At 2 year, measuring of skin lifting, has recorded 71.5% showed 3-6mm, 23.8% showed >6-10mm, considerable lifting and 4.8% showed sensational lifting more than 1 cm. NO any case showed minimal lifting 1-2 mm or zero lifting in this group. In group1, when thread lifting was used alone, it showed also considerable degrees of facial skin lifting. At 1 year, measuring of skin lifting has recorded 95.5% showed 3-6mm lifting, 5% showed more than 6-10mm, considerable skin lifting. At 2 year, measuring of skin lifting, recorded 33.3% showed 3-6mm, moderate skin lifting, 57% showed 1-2 mm, minimal lifting, 9.5 % showed no lifting.

In group 3, it was 100 % shows 3-10 mm skin lifting, couple of days after triple rejuvenation by Botox, fillers, and PRP without thread lifting, but skin lifting has declined to zero in this group after 6 months. In study conducted by Khrustaleva, [14] et al report of follow up for one year has used lifting thread in Baker groups from 2-3, and showed 91% satisfaction and 86 % satisfaction respectively. In this study, I didn't use any patient of baker 3 facial aging and confined to baker 1 and 2 only, and this could explain our relatively higher results of satisfaction. This study also differs from Khrustaleva et al one's in another point, as it not depends only on subjective assessment but also on objective one and continued up to two years follow up. This study results showed 100% of the highly satisfaction at 3 and 6 months, then all patients declined to 100% moderate satisfaction after one year. Satisfaction after two years follow up, was moderately in 47.6% of the patients treated only by thread lifting only and 38% were less satisfied.

While this study shows augmented results of patient satisfaction when Botox and fillers were added to group2 populations to be 71.5% of the patients were moderately satisfied, 12.5% highly satisfied and 12.5% continued fully satisfied. After two years follow up, 43% of the patients in group 2 were moderately satisfied, 43% highly satisfied and 14% got fully satisfied, but no any patient of this group has been dissatisfied during the period of the study. Clinical overall observation of the face has reflecting the threads' rule in correction of heights of lateral eye brows, nasolabial angle, check mandibular groove, checks' contouring, prominence of jowls, marionette lines deepening and has effecting the refinements of jaw lines curvature (nephritis' curvature). Thread lifting has potent effect in the checks and lower face, but Botox has a better lifting for the forehead. The results are showing gradual decrease in the degree of skin lifting by time. Group 2 shows the least re-sagging of the face when it is compared with other groups.

Conclusion

This study supposes methods for assessment of facial thread lifting techniques. Thread lifting technique is neither alternative to surgery, nor magic per say, but it might have good effect for rejuvenation, and skin lifting, especially when combined with another method of facial rejuvenation. Significant facial skin lifting and rejuvenations were long lasting achieved by threads throughout the 24 follow up months, although results are showing gradual decrease in the degree of skin lifting by time. The effects of the threads were highly augmented when they were combined with Botox, fillers or platelet rich plasma rejuvenations. Further studies are required to assess the longevity beyond 2 years.

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