

Subcutaneous Lateral Eyebrow Lifting with Barbed Threads Versus Subperiosteal Lift: A Prospective Cohort Study

SHERIEN METWALLY SALAMA, M.D.; AMR MAHMOUD FAYED, M.B.B.CH. and
AHMED GADALLAH, M.Sc.

The Department of Plastic, Burn and Maxillofacial Surgery, Faculty of Medicine, Ain Shams University

Abstract

Introduction: Eyebrow lifting with a temporal approach is an increasingly widespread technique. Many surgical procedures are described, but the long-term stability is dependent on the effectiveness of the anchorage of elevated tissues and approach for elevation.

Objective: In our study we compared 2 commonly utilized lateral brow lift techniques (subcutaneous temporal brow lifts and subperiosteal brow lift with barbed PDO threads as regard efficacy, longevity, safety, and patient satisfaction. This study intends to provide evidence-based insights into the advantages and limitations of each technique, aiding clinicians in making informed decisions and optimizing patient satisfaction outcomes.

Patients and Methods, Results: 20 consecutive patients aged between 40 to 60 with mild to moderate lateral brow ptosis, underwent temporal brow lift. Patients were divided into 2 groups; group 1, anchorage was performed with PDO barbed suture through closed subcutaneous approach, group 2 anchorage was performed with same suture material through open lateral temporal approach in subperiosteal plane.

The amount of brow elevation was assessed by patient satisfaction and by comparing the distance between inter-pupillary line and superior eyebrow hairline. The distance (mm) between this line and the upper edge of each eyebrow were measured in 2 points: Pupil, and lateral canthus. The follow-up was 3,6, 12-week and 6 months.

Conclusion: Subperiosteal lateral eyebrow lifting provides higher satisfaction rate and less risk of complications post-operatively.

Key Words: Subcutaneous brow lift with threads – Subperiosteal brow lift – Brow ptosis – Minimally invasive techniques.

Ethical Committee: The Ethical Committee of the College of Medicine at Ain Shams University had approved the study. Code: R00006379, Date 26/11/2023.

Disclosure: No conflict of interest.

Correspondence to: Dr. Ahmed Gadallah,
E-Mail: ahmed.gadallah93@gmail.com

Introduction

Aging causes the entire brow to sag, especially at the outer portions, resulting in a flat or even sad appearance to the brow. Aesthetically, eyebrow shape is more significant than height and is highly dependent on the level of the lateral brow complex. Over the last century, many methods to elevate the eyebrow complex have been described [1].

Lateral brow descent is a common aesthetic concern, often resulting in a tired or aged appearance. Depending on the portion of the eyebrow being addressed, different mechanisms are involved in surgically elevating the brow complex. Medially, eyebrow elevation depends on weakening of the depressor muscles plus soft tissue release; frontalis, the only brow elevator, is then allowed to do its job unopposed. Laterally, frontalis action is weak or nonexistent, so that lateral brow elevation depends completely on mechanical fixation after appropriate soft tissue release [2].

When a surgical brow elevation initially succeeds but later fails, recurrent eyebrow ptosis mostly occurs because of fixation failure caused by using too weak materials. It typically occurs in the lateral brow region [3].

Conversely, elevation of the medial brow rarely fails. To solve this problem, many fixation techniques have been described for the lateral half of the brow [4].

In youth, the brow should sit just above the level of the upper edge of the eye socket bone. The outer portion of the brow is higher than the inner portion as it slopes gently upwards, before descending slightly at its tail. Aging causes the entire brow to sag, especially at the outer portions, resulting in a flat or even sad appearance to the brows [5].

Suture- or thread-lifting are terms employed in aesthetic dermatology and surgery for procedures

intended to elevate or re-align sagging skin by means of a suture. It covers a variety of methods, which fundamentally differ in terms of invasiveness (open surgery, small skin incision, incisionless), implantation technique (anchored, free-floating), and longevity (non-absorbable, absorbable) of the suture. Furthermore, available sutures differ in their structure (monofilament, multifilament), surface characteristics (plain, coiled, barbed, cogged, with cones), dimensions, and design of introducing the needle/cannula (needleless, integrated on one or both ends of a suture, or housing the inserted part of a suture). PLACL threads are a relatively new option for thread lifting a procedure which works to physically lift the facial structure and tissues into a higher and more youthful position. PLA has an advantage of more longevity and less fibrous tissue formation, leading to less dimpling and better results [5,6].

Polydioxanone (PDO) is an absorbable synthetic polymer, which has been in clinical utilization for soft tissue approximation since the early 1980s. It is a monofilament sutures show desirable characteristics for skin suspension, such as high tensile strength and good tolerance after implantation. PDO is slowly hydrolyzed in the body and fully absorbed in 6 to 7 months [6].

Several authors have described non-endoscopic limited-incision open methods to elevate or stabilize the position of a ptotic lateral brow. These techniques vary with respect to incision length and location, plane of dissection, and method of fixation. Skin-only temporal brow lifts lack a second deeper layer of dissection and advancement for suspension [7].

Many surgical procedures for lateral brow ptosis were described demonstrating that the long-term stability is dependent on the effectiveness of the fixation method and approach of elevation. There is no comparable data between different modalities to meet patient satisfaction as regard effectiveness, longevity, complication, and aesthetic outcome [8].

This study will provide valuable insights regarding the efficacy and safety of two lateral brow lift techniques – barbed PDO subcutaneous threads and subperiosteal temporal brow lift. Comparative analysis of outcomes and complications will assist clinicians in selecting the most appropriate technique for their patients based on objective data and patient satisfaction.

Aim of work:

This study aims to prospectively evaluate the outcomes and complications associated with each technique to guide decision-making for clinicians and improve patient satisfaction.

Patients and Methods

Study design: This study is a randomized controlled trial, with two arms comparing barbed threads and subperiosteal brow lift techniques.

Participant selection: 20 consecutive participants aged between 40 to 60 years divided into two groups of two modalities concerned in the study meeting the eligibility criteria. This study concern females only as male brow aesthetics are different.

Inclusion criteria: Mild to moderate brow ptosis with adequate subcutaneous tissue thickness, no previous invasive or non-invasive brow lift procedures, no history of trauma around the upper face, cooperative, fit for surgery and have stable personality.

Exclusion criteria: Patients over 60 years with redundant skin, heavy smokers, who had undergone previous surgical or nonsurgical treatments involving the face, non-cooperative patients, psychiatric disorders. Patients who returned for follow-up and had undergone treatment with neuromodulators or fillers were excluded from the study.

Sample method: Convenience sampling.

Procedure details:

Preoperatively: Eyebrows position was evaluated for asymmetries, and different vectors of brow elevation, with the patient awake and in a standing position. Preoperative measurements of the distance between the peak of the eyebrow and the lateral canthus were made using a digital calliper, to serve as a reference during follow-up.

Photometric evaluation:

Full-size, 1:1 standardized photograph (Frankfurt horizontal plane) was acquired for each patient before surgery. Position, facial expression, focal distance, and camera settings were standardized. Postoperatively, additional sets of photographs were taken 3,6,12 weeks and 6 months. after procedure. Linear measurements were performed with Adobe Illustrator CC by drawing an interpupillary line. The distance (mm) between the upper edge of each eyebrow and interpupillary line were measured in 2 points: Pupil, and lateral canthus. Fig. (1).

A- Subcutaneous lateral brow lift: 10 participants in this arm underwent lateral brow lift using barbed PDO threads (Princess LIFT-PDO manufactured by Med First Co Ltd., Chungnam, Korea. 2 or 3 PDO 19G double needle, barbed bidirectional, convergent 18-cm threads were placed per side, inserted in a pre-determined pattern under local anaesthesia.

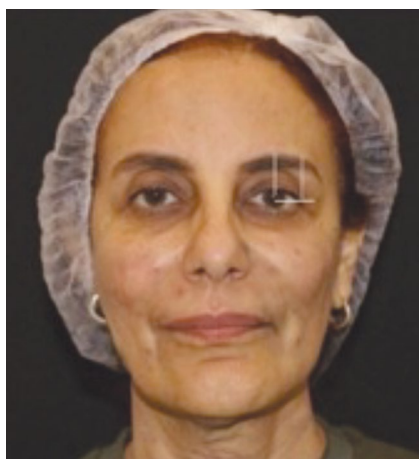


Fig. (1): Measurements between interpupillary line and upper brow at mid-pupil.

Grades of facial and brow ptosis according to Baker and Fouad Nahai classification:

Each degree was correlated with a numerical range in which >1.8cm is the normal range, 1.7-1.5 cm corresponds to degree I ptosis, 1.4-1.2cm to degree II ptosis, 1.1-0.9cm to degree III ptosis, and <0.8cm to degree IV ptosis [15].

Marking:

Only one point of entry in the lateral temporal hairline (point A). Then, two lines were drawn from point A: One line to the brow arch (point B) and another to the brow tail (point C). These lines draw an inverted V (Fig. 2).

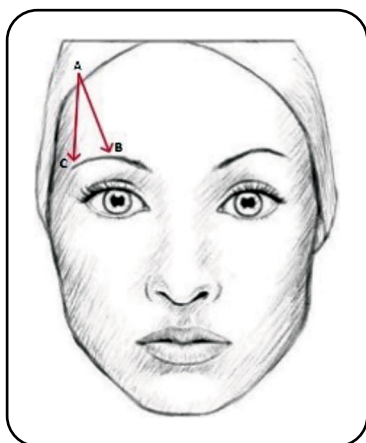


Fig. (2): Direction of insertion of the threads indicated on the lateral temporal area of with Fan technique. (A) Is the insertion point. (B, C) Are the final points the cannula must move in subcutaneous plan.

Local anaesthetic is then injected plus (adrenaline 1:100 000). The injection is done not only to anesthetize the area but also to induce vasoconstriction that helps to reduce the formation of hematomas. Furthermore, hydro-dissection is performed with the anaesthetic to better separate the tissues from each other.

Step-by-step:

First Step: Marking of the insertion points and lines (inverted V) and insertion of the 1st needle with attached thread at point A (hairline).

Second Step: The 1st needle is guided from point A to exit at the brow arch (point B).

Third Step: The exiting thread is cut off at the desired length.

Fourth Step: Insertion of the 2nd needle with attached thread at point A (same point as in the 1st Step).

Fifth Step: The 2nd needle is guided from point A to exit at the brow tail (Point C).

Sixth Step: The exiting thread is cut off at the desired length.

Two sterile stripes were placed in an anti-gravitational sense and removed after 2 days. Antibiotics were prescribed for 6 days as postoperative care.

B- Subperiosteal Brow Lift: 10 participants in this arm will receive the lateral brow lift through a subperiosteal approach under general anaesthesia.

Preoperative measurements:

Preoperative measurements of the distance between the peak of the eyebrow and the lateral canthus) were made using a digital caliper to serve as a reference during follow-up. The skin incision was placed 2cm (about 0.79 in) posterior to the temporal hairline.

The direction of the traction needed to elevate the lateral brow lies on a line that begins at the lateral third of the brow and goes back upward, making an angle of 45° with a horizontal plane. Using the lateral third of the brow as a pivot, we draw an arc in the temporal scalp area 3-4cm in length, 2cm behind the temporal hairline. The line of surgical traction crosses the middle of the drawing. (Fig. 3).

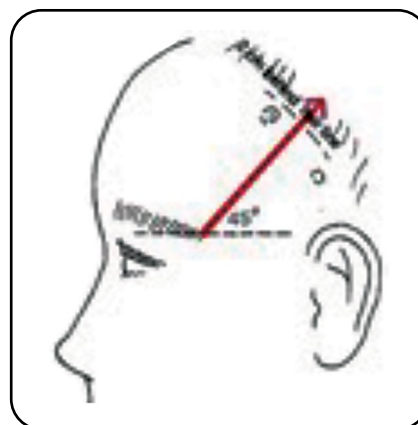


Fig. (3): Using the lateral third of the brow as a pivot, we mark the arc incision in the temporal scalp area. The line of traction is at a 45° angle with a horizontal plane.

The procedure is performed under general anesthesia. Local infiltration containing of 1:1,00000 adrenaline is injected into the planned incision and around the orbital rim deep to the temporoparietal fascia laterally and subperiosteally medially to provide hydro dissection.

The incision is made parallel to the hair follicles; Bitemporal curvilinear incisions of 3-4cm were placed throughout the skin, (2cm) behind and parallel to the temporal hairline. The incisions did not extend medial to the superior temporal fusion line, thus avoiding damage to the deep branch of the supraorbital nerve. The incision was extended deeper through the superficial temporal fascia to the level of the deep temporal fascia. Dissection was continued anteriorly, on the surface of the deep temporal fascia, to the temporal fusion line. Using a curved periosteal elevator, the fascia confluence (inferior and superior temporal line) was broken from the lateral aspect and the dissection was continued subperiosteally medially and towards the orbital rim, releasing the fibrous band that connects the orbital rim and the superficial temporal fascia deep to the lateral eyebrow.

Once the tissue was mobilized, elevation of the lateral brow and fixation was done by using two to three PDO bidirectional barbed suture. Each suture was passed through periosteum and fascia of the superolateral orbital rim, retracting the lateral eyebrow, reshaping it, and tightening the orbital portion of the orbicularis oculi muscle. The point of placement of each suture was differ from case to case in order to achieve the most aesthetically pleasing fixation of the brow.

Burring of cortical bone for tunnelling in the same vector of pull was done to ensure good placement of the suture material to gain more stabilization.

The sutures were secured to the galea of the posterior edge of the lateral incision in a radial manner achieving a wider vector of elevation. The degree of tightening of each suture affected the extent of elevation as well as the shape of the brow. Suspension fixation was performed by means of a superficial temporal fascia and fixed deep temporal fascia with absorbable 4-0 PDS stitches, these are considered "key" sutures, as they bear the entire strain of the temporofrontal compound flap. Limited removal of scalp excess was performed.

The scalp incisions were closed either with a running 4-0 Vicryl suture or with staples, and a moderately compressive dressing is applied to the forehead and temporal region and removed after 24 hours.

Outcome measures:

A- Primary Outcome Measures: The primary outcomes will include improvement in lateral brow position, as measured by pre- and post-operative

clinical photographs, validated questionnaires assessing patient satisfaction and improvement in appearance, and physician assessment.

The patients were evaluated at 3,6, 12 weeks after the procedure. They were advised not to use neuromodulators or fillers during follow-up period. Patients who returned for follow-up and had undergone treatment with neuromodulators or fillers were excluded from the study. Digital photographs were taken to document the preoperative brow position, surgical technique, and postoperative results. The quality of the photographs, which appear standardized for size, lighting, and head position, are superb and makes it easy to compare the preoperative and postoperative appearances.

B- Secondary Outcome Measures: The secondary outcomes encompass complications, adverse events, duration of post-operative swelling/bruising.

Statistical analysis:

Quantitative (numerical) variables will be described as mean \pm SD, ordinal as median (interquartile range) and qualitative (categorical) data as numbers and percentage. Student's *t*-test, Mann-Whitney U-test and Chi-square test or Fisher's exact test will be used for comparisons as appropriate.

Statistical package:

Statistical analysis performed using computer software statistical package for the social science (SPSS). A paired sample test was performed between each group to detect eyebrow position (i.e., between pre- and postsurgical procedure, at 3,6, 12-week and 6 months of follow-up).

Results

Table (1): Demographic data.

Demography	Subcutaneous	Subperiosteal	Total
Number	10	10	20
Age			<i>p</i> -value
Range	45-60	45-60	0.291
Mean \pm SD	51.9 \pm 5.84	52.9 \pm 4.96	

There was no statistically significant difference between both groups according to the demographic data (*p*-value 0.291).

A- Patient satisfaction:

All patients will be assessed via direct interviews by surgeons. The subjects will fill out the questionnaire by themselves. Face-to-face interviews will be conducted with the patients in their native language. Patients evaluated their experiences on a five-point Likert-style scale, with 1 being the least satisfied and 5 being the most satisfied.

Table (2): Outcome of questionnaire assessing the post operative patient's satisfaction.

Satisfaction score	Subcutaneous	Subperiosteal
Median (IQR)	2 (1-3)	4 (3-5)
Range	1-3	3-5
Unsatisfied	4 (40%)	2 (20%)
Satisfied	6 (60%)	8 (80%)

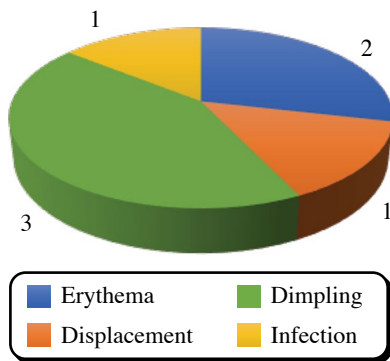


Fig. (4): Post-operative complications among subcutaneous group.

B- Complication assessment:

Table (3): Complications among both groups.

Complication	Subcutaneous	Subperiosteal
Superficial displacement	1 (10%)	0
Erythema	2 (20%)	2 (20%)
Skin dimpling	3 (30%)	1 (10%)
Facial stiffness	0	0
Infection	1 (10%)	0
Overall	7 (70%)	3 (30%)

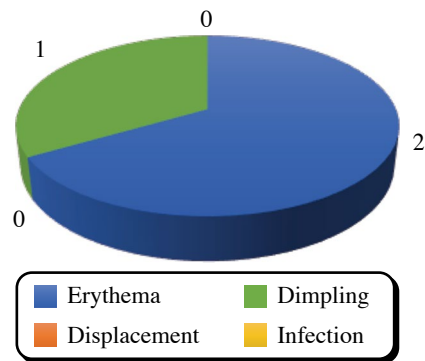


Fig. (5): Post-operative complications among subperiosteal group.

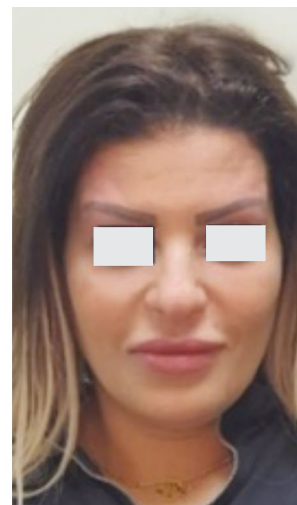


Fig. (6): A 45-year-old female underwent subperiosteal eyebrow lifting. (A): Pre-operative, (B): Post-operative.

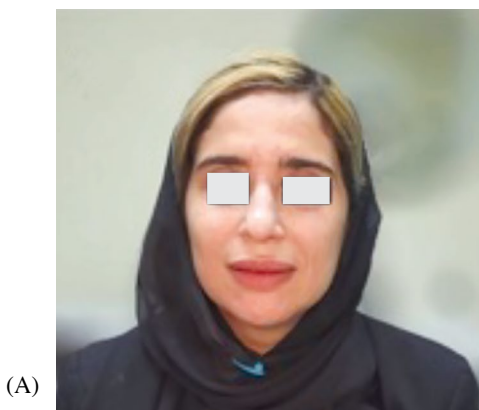


Fig. (7): A 40-year-old female underwent subcutaneous eyebrow lifting. (A): Pre-operative, (B): Post-operative.

Discussion

Lateral brow descent is a common issue faced by individuals seeking facial rejuvenation. While several surgical techniques are available for lateral brow lift including barbed threads and subperiosteal brow lift, their comparative effectiveness and potential complications remain uncertain.

Thread lifts look easy to perform, but obtaining stable and consistent results requires that the surgeon must have expertise in muscle kinetics, soft tissue anatomy, thread mechanics, and immunologic processes associated with suture placement, in addition to surgical skill, aesthetic judgement, practice, and experience.

In our study, 1 patient in subcutaneous group experienced superficial displacement of suture to dermis with 0% displacement in subperiosteal group. We recognise that our suture insertion approach may have contributed to this problem, at least in part. For the majority of these individuals, thread removal was required because facial massage was often ineffective in treating this problem.

Infection in our study found in only 1 patient is the subcutaneous group 5% of total patients which is like Bertossi et al, as infection occur in 6.2% of patients [9]. Antibiotic prophylaxis may be beneficial before suture implantation. Other surgeons who conduct face cosmetic surgeries frequently advise giving antibiotics prior to other forms of implantation, such as breast or buttock augmentation.

Skin dimpling occurred in 3 patients in subcutaneous group compared to 1 patient in subperiosteal group. While erythema occurred in equal manner in both groups (2 patients in each group) and facial stiffness had been not happened to any patient.

The following complications related to the application of barbed sutures for face surgeries have been reported by other researchers: A brief sensation of tightness, transitory neuropathy, and harm to the parotid duct or the branches of the regional nerves. In two trials, Sulamanidze et al., discovered that moderate incidences of skin dimpling (14.6%), hematoma and/or haemorrhage (9.5%), and hypercorrection (9.5%) were observed in 157 patients who had Contour thread implantation and were followed for 2.5 years [10].

IN scientific literature and in commercial advertisements, face surgeries with barbed sutures have been described as having immediate patient satisfaction, as no need for general anaesthesia, minimal downtime, and a minimal risk of complications, compared with more invasive procedures. We agree that patients had tolerable or no pain with

this procedure under local anaesthesia and that patient satisfaction in the immediate postoperative period was high. In hour study the satisfaction rate was higher in subperiosteal group (80%) compared to subcutaneous group (60%) due the longevity and maintenance of cosmetic result achieved by subperiosteal technique compared to subcutaneous technique [11,12,13].

Conclusion:

This prospective cohort study intends to contribute to the existing literature by comparing the outcomes of lateral brow lift procedures using subcutaneous and subperiosteal brow lift techniques. The results obtained from this study provide valuable evidence to aid clinicians in making informed decisions and optimizing patient satisfaction.

References

- 1- Paul M.D.: "The evolution of the brow lift in aesthetic plastic surgery." *Plastic and reconstructive surgery*, Vol. 108, 5: 1409-24, 2001.
- 2- Rohrich R.J. and Beran S.J.: "Evolving fixation methods in endoscopically assisted forehead rejuvenation: controversies and rationale." *Plastic and reconstructive surgery* Vol. 100,6: 1575-82; discussion 1583-4, 1997.
- 3- Wong, Vincent: "The Science of Absorbable Poly(L-Lactide-Co-ε-Caprolactone) Threads for Soft Tissue Repositioning of the Face: An Evidence-Based Evaluation of Their Physical Properties and Clinical Application." *Clinical, cosmetic, and investigational dermatology*, Vol. 14: 45-54, 13 Jan. 2021.
- 4- Preibisz, Lukasz, et al.: "Barbed Polydioxanone Sutures for Face Recontouring: Six-Month Safety and Effectiveness Data Supported by Objective Markerless Tracking Analysis." *Aesthetic Surgery Journal*, Vol. 42, 1: NP41-NP54, 2022.
- 5- Wu, Woffles T.L.: "Commentary on: Effectiveness, Longevity, and Complications of Facelift by Barbed Suture Insertion." *Aesthetic Surgery Journal*, Vvol. 39, 3: 248-253, 2019.
- 6- Chusak, R.B, and D G Dibbell. "Clinical experience with polydioxanone monofilament absorbable sutures in plastic surgery." *Plastic and reconstructive surgery* vol. 72,2 (1983): 217-21.
- 7- Molea G., et al.: "Comparative study on biocompatibility and absorption times of three absorbable monofilament suture materials (Polydioxanone, Poliglecaprone 25, Glycomer 631)." *British Journal of Plastic*, Vol. 53, 2: 137-41, 2000.
- 8- Miller T.A., et al.: "Lateral subcutaneous brow lift and interbrow muscle resection: Clinical experience and anatomic studies." *Plastic and Reconstructive Surgery*, Vol. 105, 3: 1120-7; discussion 1128, 2000.

- 9- Bertossi, Dario et al.: "Effectiveness, Longevity, and Complications of Facelift by Barbed Suture Insertion." *Aesthetic Surgery Journal*, Vol. 39, 3: 241-247, 2019.
- 10- Sulamanidze M.A., Paikidze T.G., Sulamanidze G.M. and Neigel J.M.: Facial lifting with "APTOS" threads: Featherlift. *Otolaryngol. Clin. North Am.*, 38 (5): 1109-111, 2005.
- 11- Houchman M.: Midface barbed suture lift. *Facial Plast. Surg. Clin. North Am.*, 15 (2): 201-207, 2007.
- 12- Atiyeh B.S., Dibo S.A., Costagliola M. and Hayek S.N.: Barbed sutures "lunch time" lifting: Evidence-based efficacy. *J. Cosmet Dermatol.*, 9 (2): 132-141, 2010.
- 13- Rachel J.D., Lack E.B. and Larson B.: Incidence of complications and early recurrence in 29 patients after facial rejuvenation with barbed suture lifting. *Dermatol. Surg.*, 36 (3): 348-354, 2010.
- 14- Mutaf, Mehmet: "Mesh lift: A new procedure for long-lasting results in brow lift surgery." *Plastic and Reconstructive Surgery*, Vol. 116, 5: 1490-9; discussion 1500-1, 2005.
- 15- Real D.S.S., Reis R.P., Feitosa R.G.F., Garcia E.B. and Ferreira L.M.: Clinical classification of brow ptosis. *Rev. Bras. Cir. Plást.*, 31 (3): 354-361, 2016.