MACS-lift have expanded. MACS lift, in combination with ancillary procedures such as neck contouring, is capable of delivering excellent results to the vast majority of patients seeking facial rejuvenation. Patients with profound neck laxity occasionally require a direct neck lift during facial rejuvenation procedures but this has become fairly unusual.

AIM OF THE WORK

The aim of this work is to evaluate the aesthetic and clinical results of the MACS lift and the need for additional procedures to improve these results.

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PATIENTS AND METHODS

This study was carried out on 20 cases suffering from various degrees of aging face admitted to the **Plastic and Reconstructive Surgery Unit of the Main Alexandria University Hospital** in the period from January 2012 to December 2013.

- **Inclusion criteria:**

Cases showing signs of aging face including;

1. Laxity and sagging of the skin of the cheeks and neck
2. Prominence of the nasolabial folds
3. Deepening of the nasolabial perioral commissural creases
4. Formation of jowls
5. Less distinct jawline
6. Atrophy of the subcutaneous adipose tissues
7. Ptosis of the soft tissues of the anterior aspect of the chin
8. Wrinkling and laxity of the neck skin and formation of platysmal bands and obtuse cervicomental angle.

- **Exclusion criteria:**

1. Heavy smokers who are unwilling to stop smoking
2. Patients suffering uncontrolled diabetes
3. Patients with uncontrolled hypertension
4. Patients suffering from collagen and connective tissue diseases
5. Poor skin quality and keratosis
6. Emotionally unstable patients or history of mental illness specially body dysmorphic disorder.

I. Pre-operative evaluation

I.1. History taking:

During the initial visit, we collected patient personal history including:

Personal data: Age, occupation, hobbies, smoking, and sun exposure

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General history:

- Cardiaovascular history: Cardiovascular disease was not a contraindication to surgery; however, the patient would need to be evaluated by their cardiologist and cleared for surgery. The single most important variable in the preoperative medical evaluation of potential rhytidectomy patient was the status of their blood pressure. Uncontrolled hypertension, in our opinion, was an absolute contraindication to performing face-lift surgery. Hypertension significantly increased the dreaded risk of hematoma formation and a less than ideal result (106,107).
- Diabetes and autoimmune disease were not absolute contraindications to surgery, unless they were advanced or uncontrolled (106-108).
- Renal and kidney disease are also important to recognize preoperatively.
- The mental state was assessed, as we considered patients not suitable if (108,109):

A. They have unrealistic expectations of surgery.
B. Suffer from any mental condition, whether it was depression or body dismorphophobia or a body image problem, they should be excluded from surgery.
C. Very aggressive patients who seem angry about something not related to the surgery.
D. The deformity was so minute and the patient magnifies its significance and its magnitude. Remember, a millimeter on the face is a mile on the brain in the thinking of those patients.
E. Patients with relationship difficulties and depression might not undergo surgery until they are stable.

- Smoking was not an absolute contraindication to surgery (110) but wolud definitely influence the planned procedure. An individual who smokes more than one pack per day was a poor candidate for face- lift surgery. Up to a one pack per day smoker should be encouraged to cut down or stop smoking for 1 month prior to surgery and should have a more conservative procedure with a "shorter" flap and no tension on the skin flap.

Specific history:

We asked our patient some questions including:

- We started with an open question 'How can I help?' and let the patient voiced their areas of concern
- How long had they been considering facial rejuvenative surgery?
- Which areas particularly bothered them?
- What kind of appearance did they want? Did they want to look refreshed or significantly younger?
- Have they had any rejuvenative procedures in the past?

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- Did they know anyone who has had this type of surgery?
- How much 'downtime' would they accept?
- Did they have any specific deadlines/events at which they might be presentable?

I.2. Clinical evaluation:

The skin of the middle and lower thirds of the face was palpated for thickness, elasticity, and mobility. Several texture changes, such as the crepe paper-like skin from actinic damage or surface irregularities along the lower lip and chin from the effect of muscular contractions, were noted because they usually remain unaffected by face lift surgery and might need additional procedures.

The malar area was observed for contour and symmetry. High cheekbones were a benefit in obtaining a favorable result. Flat malar areas were often associated with significant midface laxity, manifested by malar nasojugal grooves, infraorbital malar cresents, malar fat pad ptosis, and prominent nasolabial folds. "Malar pouches" (fluid accumulations in the fatty tissue over malar area were not to be corrected by face lift (Figure 25).

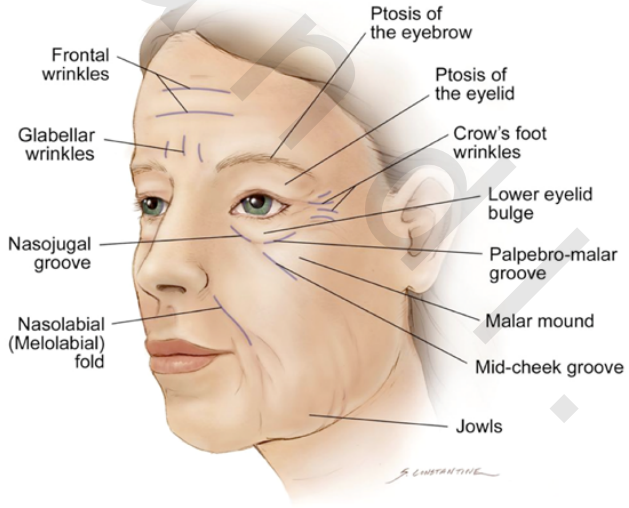

Figure (27): Signs of facial aging (106)

An idea of the improvement to the nasolabial fold anticipated by lifting the face was obtained by gentle fingertip lifting of the facial skin with the fingers placed

in the malar and temporal areas. It was important to know that the nasolabial crease, which is engraved in the skin, would not be eliminated by face lifting alone.

The perioral area was examined for rhytidies and lax skin. The lax skin would be corrected with face lifting procedure, while the residual imprinted creases could be improved with dermabrasion, a range of chemical peels, or laser ablation.

The jawline and jowl area were examined for contour, fullness, and laxity. Gently lifting the skin along the posterior border of the face and just above the angle of the mandible would give an idea of the anticipated improvement in the lower third of the face (Figure 27). A largely vertical vector lift would be required to correct the jowls.

Figure (28): Vertical lifting of the skin above the angle of the mandible giving an idea of the anticipated improvement. Notice, there was no excess skin in the neck region.

The lower jawline and neck were inspected for submental and submandibular fat deposits, submaxillary gland ptosis and mandibular contour, the depth of the cervicomental angle, and platysma muscle anatomy. Voluntary platysma animation helped demonstrate the platysma and its contribution to the presenting clinical appearance, as well as the presence of subplatysmal fat.

One of the most useful methods for preoperative evaluation of the patient as a candidate for minimal-scar procedure was to vertically elevate the skin on the side of the patient's face just in front of the tragus, thereby simulating the vertical vectors of the MACS-lift. With one hand elevating this tissue, we observed the junction of the earlobe and the neck skin. If there were no folds of excess skin extending posteriorly beyond that area, the patient would be an excellent candidate for MACS-lift (Figure 28). If there was excess skin or a fold developed there, then the patient would need extra procedures besides MACS-lift or would go for full-scar face lift procedure (Figure 29).

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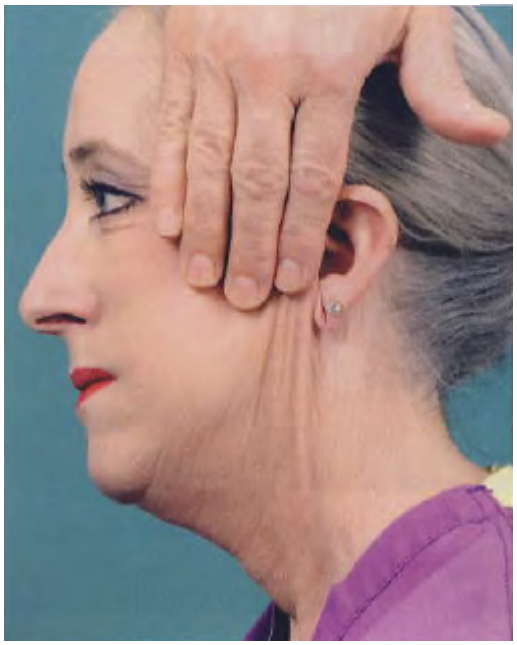

Figure (29): Vertical lifting of the skin above the angle of the mandible show excess in neck skin expressed as skin folds beyond the ear lobe (105).

In patients with bilateral vertical platysmal bands, or "turkey gobbler" deformity, inspection usually suggests a lack of decussation of the medial platysma borders. However, at surgery, the platysma sometimes was observed to decussate across the midline above the hyoid, and bands were formed from folds of paramedian platysma muscle lateral to the decussation. Similarly, in patients with oblique cervicomental angles, palpation of a firm upper neck suggested a low lying hyoid bone. However, occasionally at surgery, excessive subplatysmal fat (that tensely bulges the superficial neck fascia and platysma anteriorly) was found, while the hyoid bone was in normal position.

The patient's hair was examined in all areas for texture, thickness, and hairline contour. Incision line would be planned to achieve maximal lifting and camouflage with minimal or no hairline change. The temporal scalp posterior to the planned incision was examined for vertical laxity, which if present could cause downward displacement of the scar line, and should be taken into consideration wile planning the incision line. Hair that was brittle from excessive coloring would have a tendency to break off in areas along the incision, and this would be an indication for minimal incision. Finally, we checked the function of cranial nerves V and VII as shown in Table 1 and 2

Cranial nerve V: Trigeminal
• Corneal reflex: patient looks up and away. • Touch cotton wool to other side. • Look for blink in both eyes, ask if can sense it. • Repeat other side [tests V sensory, VII motor]. • Facial sensation: sterile sharp item on forehead, cheek, jaw. • Repeat with dull object. Ask to report sharp or dull. • If abnormal, then temperature [heated/ water-cooled tuning fork], light touch [cotton].

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- Motor: pt opens mouth, clenches teeth (pterygoids).
  • Palpate temporal, masseter muscles as they clench.
- Test jaw jerk:
  - Dr's finger on tip of jaw.
  - Grip patellar hammer halfway up shaft and tap Dr's finger lightly.
  - Usually nothing happens, or just a slight closure.
  - If increased closure, think UMNL, esp pseudobulbar palsy.

Table 1: clinical examination of cranial nerve V (107)

Cranial nerve VII: Facial
• Inspect facial droop or asymmetry. • Facial expression muscles: pt looks up and wrinkles forehead. • Examine wrinkling loss. • Feel muscle strength by pushing down on each side. • Pt shuts eyes tightly: compare each side. • Pt grins: compare nasolabial grooves. • Also: frown, show teeth, and puff out cheeks. • Corneal reflex already done (See CN V).

Table 2: clinical examination of cranial nerve VII (107)

I.3. Photographic Assessment

This part must be performed by observing the patient indirectly by using a set of five high-quality photographs (one frontal, two profiles and two intermediate).

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The photographic assessment includes the division of the face into three regions (middle face, lower face, and upper neck); and classification of the observed laxity into one of six grades, each one with distinctive signs (Figure 30) for each region according to Tables 3-7.

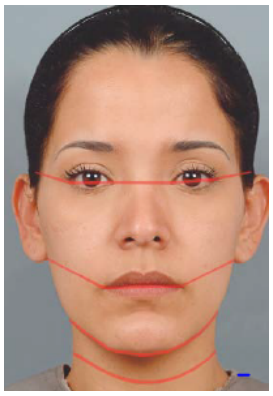

Figure (30): Section of the face [111].

The before mentioned regions included the zone around the sign that mainly or secondarily reflects the laxity of the whole region, like the nasojugal and melolabial folds in the middle region, the jowls in the lower region and the platysma bands in the neck, this being the reason for not using the classic division by thirds in the anatomical approach to study the aging face [112, 113].

Step 1: The subject's face was divided into regions as follows:

1. **Middle face:** This region covers the area that begins at a horizontal line that crosses the pupils and extends to a horizontal curved line that crosses the commissures of the mouth and the lower insertion of the ear.
2. **Lower face:** This region covers the area that begins at a horizontal curved line that crosses commissures of the mouth and the lower insertion of the ear, and extends downward up to the jaw line.
3. **Upper neck:** This region covers the area from the jaw line to the horizontal line that crosses the upper boundary of the thyroid cartilage.

Step 2: the laxity in each region on each side of the face was classified according to Table 3-7 [114].

Grade	Middle face Cheekbone roundness

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0	Full	
1	The central upper part of the cheekbone roundness is interrupted by an indentation	
2	Nasojugal fold extends across the mid point of the cheekbone tissue	
3	Nasojugal fold crosses the cheekbone tissue	
4	The fold extend to form a flattened area	
5	Completely flattened cheekbone tissue stretching the lower eyelid downward	

Table 3: Photographic grading of cheekbone roundness (114)

Grade	Middle face Nasolabial fold

0	Absent	
1	Slightly Noticeable	
2	Defined	
3	Prominent	
4	Deeply marked crease	
5	Line hidden by skin folding	

Table 4: Photographic grading of the nasolabial fold [114]

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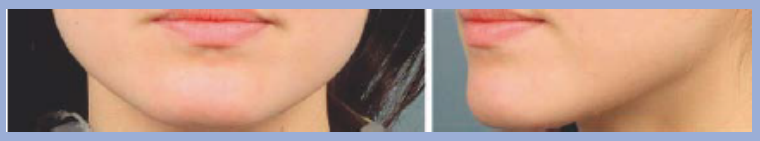
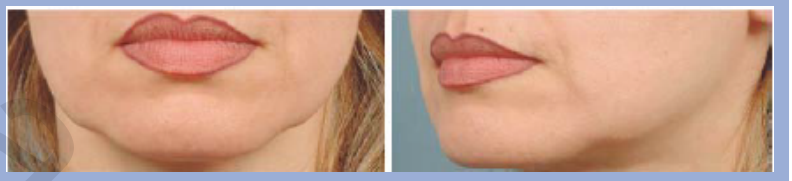
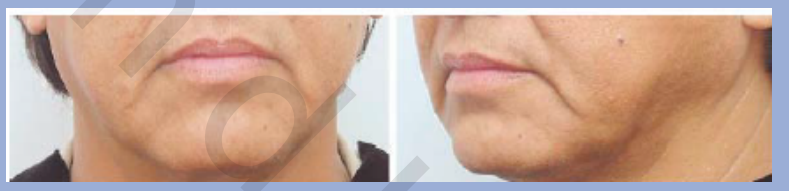
Grade	lower face Jowls	
0	Absent	
1	Slightly Noticeable	
2	Protruding forward	
3	Protruding forward and downward	
4	Forward protrusion with downward sagging	
5	Forward sagging and lateral loss of definition in the neck	

Table 5: Photographic grading of the jowls [114]

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Grade	Upper neck Platysma bands	
0	Absent	
1	Absent	
2	Slightly noticeable	
3	Prominent	
4	Sagging	
5	Sagging to the point where bands or folds are no longer distinguishable	

Table 6: Photographic grading of the platysma bands [114]

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Grade	Upper neck Horizontal folds	
0	Absent	
1	Absent	
2	Absent	
3	Slightly noticeable	
4	Prominent	
5	Sagging to the point where bands or folds are no longer distinguishable	

Table 7: Photographic grading of the horizontal folds [114]

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Step 3: We filled out the photographic assessment table (Table 8).

Region	Left	Right
Middle face		
Lower face		
Upper neck		

Table 8: Photographic assessment table.

As a demonstration of the process of photographic assessment of patients, two cases have been classified:

Case 1 (Figure 31): The middle region corresponded to grade 2 "nasojugal fold extends across the midpoint of the cheekbone and the melolabial fold is defined." The lower region of the face in this also corresponded to grade 2 "forward protrusion." The neck presented changes corresponding to grade 2 "Slightly noticeable platysma bands" without the presence of horizontal folds. There were no significant differences between sides, so the table might be filled out as in Table 9.

Figure (31): Case 1; grade 2 laxity.

Region	Left	Right
Middle face	2	2
Lower face	2	2
Upper neck	2	2

Table 9: Photographic assessment of case 1.

Case2 (Figure 32): The middle region corresponded to class 4 "nasojugal fold extend to form a flattened area." The lower region of the face in this case presented an extensive laxity that corresponds to class 4 "forward protrusion with downward sagging." The neck presented also changes corresponding also to class 4 "platysma bands sagging" with the presence of horizontal folds. There were no significant differences between sides, so the table might be filled out as in Table 10.

Figure (32): Case 2; grade 4 laxity.

Region	Left	Right
Middle face	4	4
Lower face	4	4
Upper neck	4	4

Table (10): Photographic assessment of case 2.

I.4. Assessment of the Biological Suitability for Surgery

Various preoperative tests needed to be performed in order that patients could safely undergo surgery. This list served as an example of which tests might be requested preoperatively as each patient would have different tests depending on their individual medical history (108).

Baseline Study

A. Blood tests, such as kidney function, hemoglobin, and clotting factors
B. Urinalysis
C. Electrocardiogram

Pre-operative Instructions:

These instructions were told and given on printed paper to our patients one month prior to surgery in which we informed them to:

A. Prevent the intake of aspirin or other medicines that changes coagulative profile, and thus lead to bleeding and bruising complications, for 1 week before your surgery. This includes vitamin E and other herbal/nonmedical preparations (115, 116).
B. Bring a pair of sunglasses, a headscarf, and/or a hat to wear upon discharge. In addition, plan to wear shirts that open at the front and do not require being pulled over your head (115, 117).

C. Do not wear any makeup, lotions, or creams on the day of your surgery. Wash your hair and face on the morning of the operation.
D. Avoid smoking for as long as possible, but for at least 2 weeks before the operation. The longer the patients give up smoking the better. Smoking reduces the amount of oxygen in the blood which is likely to cause problems with wound healing (110).

II. Operative technique

The MACS-lift is a facial rejuvenation procedure for correction of the aging neck and lower and middle thirds of the face. The core principle of the technique is a pure antigravitational facial rejuvenation by acting on the deep facial soft tissues and the skin in the same vertical direction.

In the simple MACS-lift (Figure 33) a limited skin undermining was performed through a preauricular and temporal prehairline incision, two purse-string sutures were used for correction of the neck, the jowls and the marionette grooves. They were both anchored to the deep temporal fascia above the zygomatic arch 1 cm in front of the auricular helix. The first suture run as a narrow vertical U-shaped purse string to the region of the mandibular angle. Tying this suture under maximal tension produces a strong vertical pull on the lateral part of the platysma muscle, correcting the neck region. The second purse-string suture started from the same anchoring point above the zygomatic arch, and run obliquely in the direction of the jowls as a wider O-shaped loop. This suture corrected the jowls, the marionette grooves and the downward slanting of the corners of the mouth (31).

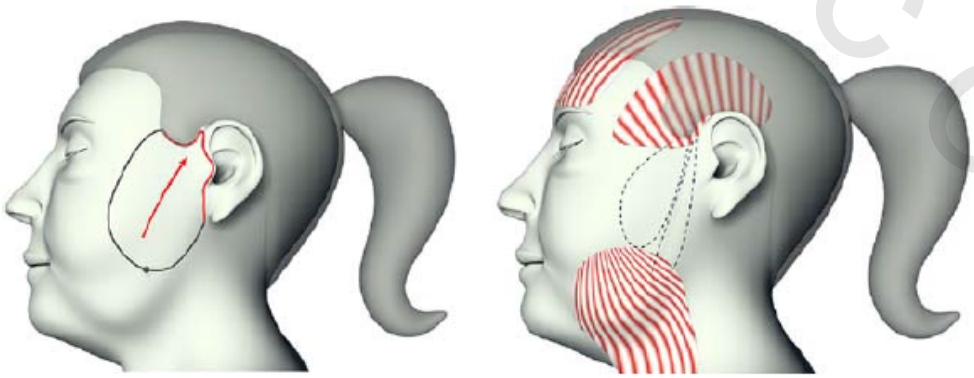

Figure (33): Simple MACS-lift, extent of dissection and suspension sutures (31).

When performing an extended MACS-lift (Figure 34), an additional undermining of the skin over the malar region was performed. A point dropped 2 cm below the lateral canthus had been marked with the patient in the standing position. It would be included in the skin undermining and is the inferior limit of the third purse-string suture. This suture also originated from the deep temporal fascia, but in its anterior part, lateral to the lateral orbital rim. It provided a strong correction of the nasolabial fold, an enhancement of the malar region, a lifting of the midface and a shortening of the vertical height of the lower eyelid (31).

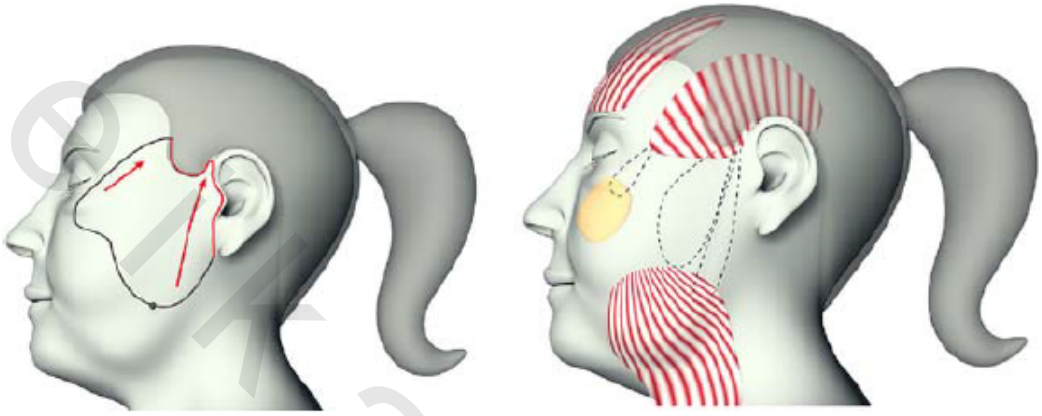

Figure (34): Extended MACS-lift, extent of dissection and suspension sutures (31).

II.1. Preoperative Marking Incision :

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The marking started at the lower limit of the lobule, going up in the preauricular crease. At the level of the incisura intertragica the marking make a 90° turn backwards to preserve the integrity of this anatomical landmark. The marking then followed the posterior edge of the tragus, ascending towards the helical root. At the superior limit of the ear the marking followed the small hairless recess between the sideburn and the auricle and then turns downward to follow the inferior implantation of the sideburn. In men the marking descended approximately 1.5 cm before turning anteriorly to cross the sideburn [31, 104].

Figure (35): Incision marking: Change of the original linear temporal incision into a zigzag one [104].

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The marking runs further forward in a zigzag pattern (Figure35), 2 mm within the lower and anterior implantation of the sideburn. The zigzag incision would unfold and stretch into a linear scar when it was coapted to the linear resection border or the cheek flap after resection of the skin flap [31, 104]. The zigzag pattern would compensate for the incongruence in length between incision and excision border, and the risk of dog-ears in this region will be reduced.

In this part of the incision, the knife was inclined to an angle almost tangential with the skin so as to cut hair shafts perpendicularly (Figure 36). This maneuver would allow hair to grow through the scar [118]. After hair regrowth, the final scar would be hidden a few millimeters within the hairline and become virtually invisible.

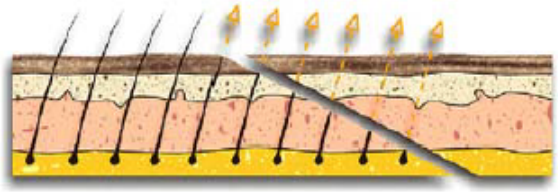

Figure (36): According to Camirand [118], the incision in the temporal area is made perpendicularly to the hair shafts. This will allow hair regrowth through the scar and through the skin in front of the scar, thus hiding the scar within the hair-bearing skin.

In the simple MACS lift the incision would be extend to the level of the lateral canthus. In an extended MACS lift the incision went up to the level of the tail of the eyebrow [31]. The total length of the incision would usually not exceed 7–9 cm, depending on the dimensions of the auricle (vertical branch of the incision) and the width of the sideburn (horizontal branch of the incision).

The mandibular angle was palpated with the index finger and a point 2 cm lower than mandibular angle was marked as the lowest point of the undermining [105]. The extent of the undermining was marked starting from the lowest point of the incision at the lobule, directed towards the marking of the mandibular angle, and then curving anteriorly to 5–6 cm in front of the ear (Figure 33). In the case of an extended MACS lift, the undermining of the malar eminence is included in the demarcation (Figure 34).

II.2. Anesthesia

Most of our patients choose general anesthesia. Local anesthesia with sedation was reasonable alternative that some patients request. Regardless of the method chosen, once sedation or anesthesia induction had occurred, local infiltration was performed using our standard face-lift mixture.

Hunstad face-lift infiltration formula [120]

Normal saline	500ml
1% Lidocaine	50ml
Epinephrine 1:1000	1ml

Kenalog-40 1ml

Infiltration of local anesthetic (150 to 300ml) was valuable because it creates a hydrated subcutaneous environment with distinct soft tissue planes and desirable vasoconstriction. These planes were easily visualized and allowed for easier dissection throw these planes, most importantly planes of dissection over the platysma and orbicularis oculi. The incision line was injected superficially, immediately below the dermis to provide profound incision line vasoconstriction.

If endotracheal intubation was performed, the endotracheal tube was secured carefully, and the eyes were protected with ophthalmic ointment to prevent dryness during the procedure. Careful preparation and draping are then performed, with the drapes usually secured with silk sutures to prevent displacement.

II.3. Flap Creation

The prehairline incision is made with a No. 15 blade perpendicular to hair follicles in a tight zigzag pattern. This approach permits hair growth to occur postoperatively not only through but also in front of the incision line. Dissection then carried to the subcutaneous fat. The skin over the tragus is usually elevated with electrocautery, if it is mobile, or with curved iris scissor if it is adherent.

From this point forward, the dissection was carried shapely with No. 15 blade. The dissection was performed in a subcutaneous plane, starting by a very thin layer of subcutaneous fat (one or two lobule of fat) for the first 1 cm of the flap, and then the flap became thicker as we go keeping the desired plane of dissection above the SMAS (Figure37).

Sharp dissection would go on until the anterior border of the parotid fascia after that the dissection was carried blindly with Rees-type facelift scissors (Figure 38). The dissection was performed in the same subcutaneous plane. The points of the scissors were directed towards the skin to have visual and palpable control over the thickness of the cheek flap [31, 104]. Most of the dissection was done by spreading maneuver with the scissor (Figure 38). Care was taken to create a flap of sufficient thickness to mask small irregularities of the underlying layer.

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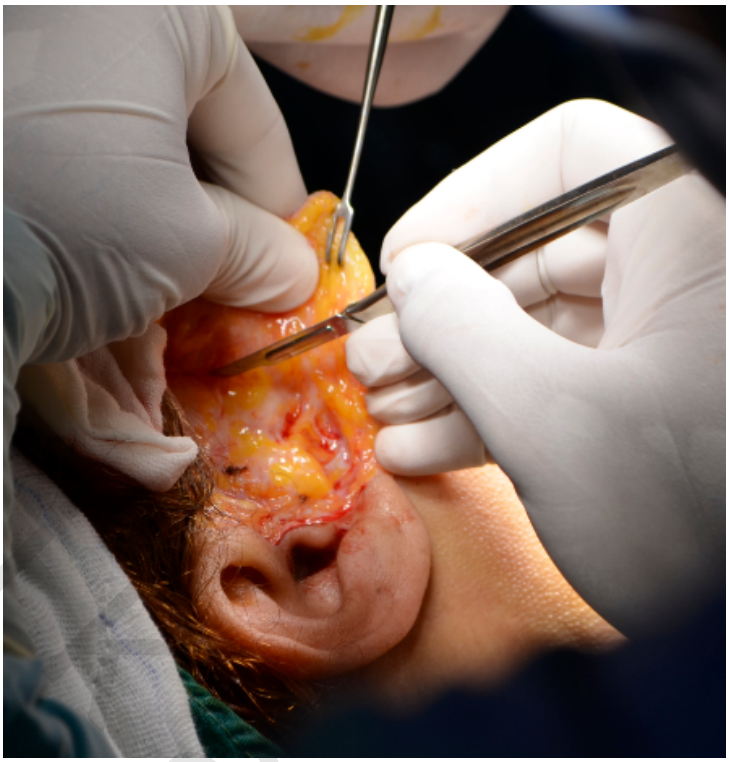

Figure (37): Sharp dissection of the first part of the flap till the end of parotid fascia

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a

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b

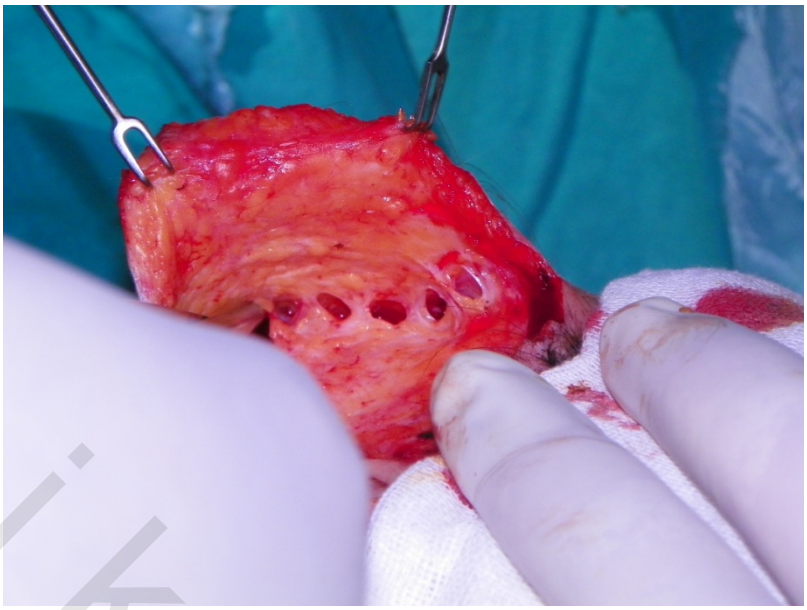

Figure (38): Blunt dissection of the skin flap. **a.** Blind blunt dissection scissors underneath the skin. **b.** tunnels formed by blunt dissection.

Dissection performed inferiorly until the fascia of the platysma was identified below the angle of the mandible. To identify the critical fibrous portion of the platysma, dissection would need to be performed up to 2 cm inferior to the mandibular border (104). The dissection then continued anteriorly over the muscle itself along the jawline. Once the fascia and muscle were seen, the dissection became very safe, with facial planes clearly evident, magnified by the hydrated tissue plane separation resulting from infiltration (Figure 39). The muscle was clearly seen separated from the overlying fatty soft tissue and dissection was performed immediately superficial to the muscle. This ensured preservation and protection of all of the soft tissue of the face as well as the accompanying blood vessels superficial to the SMAS. Thus the most vascularized and robust facial skin flap possible was preserved.

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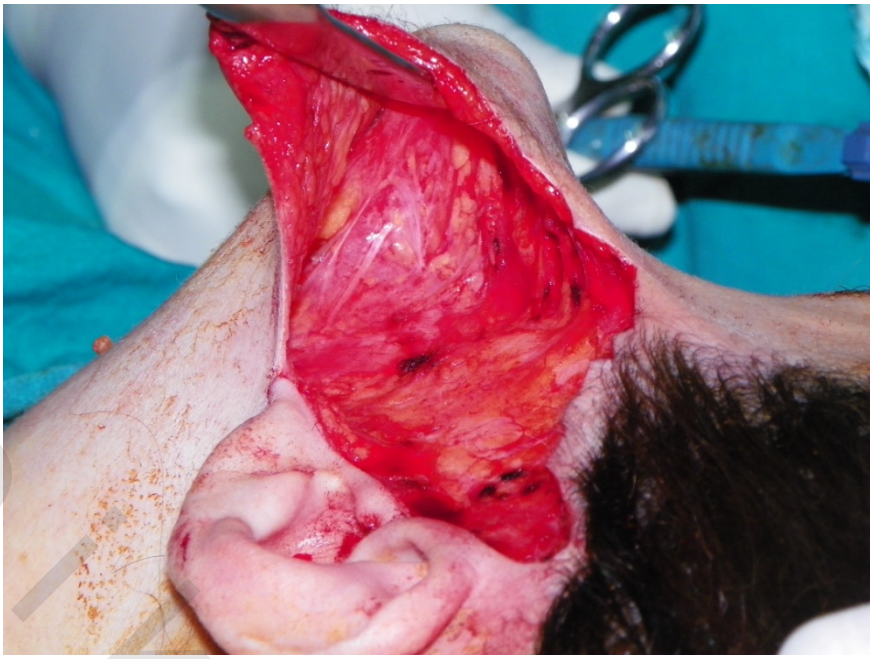

Figure (39): Raised skin flap, shown the SMAS and platysma.

In extended MACS-lift dissection was performed superiorly until the lateral edge of the orbicularis oculi muscle seen. Care was taken to avoid undermining the orbicularis by dissecting too deep, once the lateral edge of the muscle was reached, dissection over the muscle is straightforward because of the hydrated state achieved by the local infiltration [31]. That was a very safe plane because it is superficial to the muscle.

II.4. The First Purse-String Suture: the Vertical Loop

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This suture would be fixed to the deep temporalis fascia at a point 1 cm above the zygomatic arch and 1 cm in front of the helical rim [104] (Figure 40). In case of local anesthesia, an extra dose of local anaesthetic injected at the anchor point down to the temporal bone, withdrawing the needle and infiltrating all layers of tissues.

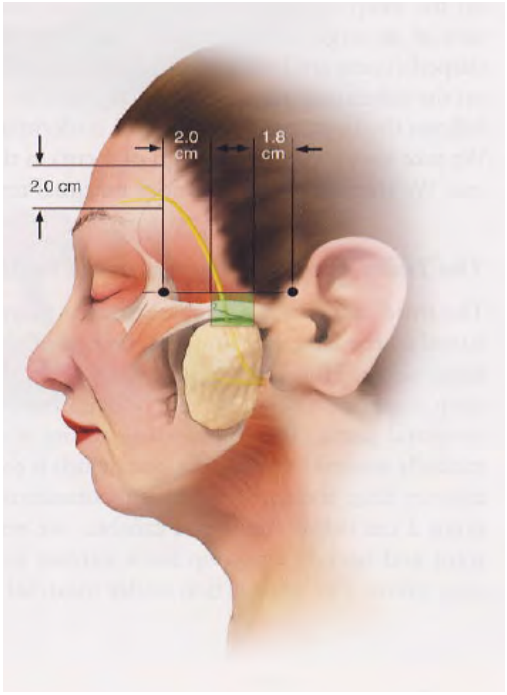

Figure (40): Safe areas for fixing the purse-string suspension sutures. Dangerous zone 1 is marked in green [121].

With the iris scissors in the spreading mode a 0.5-cm-diameter window was made in the subcutaneous tissue to visualize the deep temporal fascia (Figure 41). It should be identified as a distinct white shiny layer. A 2-0 permanent suture on a big V-7 needle was used to perform the suspension of the sagged facial and neck soft tissues. Monofilament polypropylene (Prolene) [31, 104].

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Figure (41): Window in the subcutaneous tissue showing the deep temporal fascia.

The first bite started in the window where we visualize the deep temporal fascia and went down to the temporal bone. The needle was oriented towards the tragus so there is no danger of damaging any facial nerve branch. Firm bites 1–1.5 cm long and 0.5 cm deep were taken in the SMAS tissue, which consisted of parotid fascia in the upper two thirds and platysma in the lower third (Figure 42). It was essential to confirm that every bite of the needle takes a substantial part of SMAS tissue, so that the suture would not pull through [104, 121]. The suturing went down towards the region of the mandibular angle until the lower limit of the undermining.

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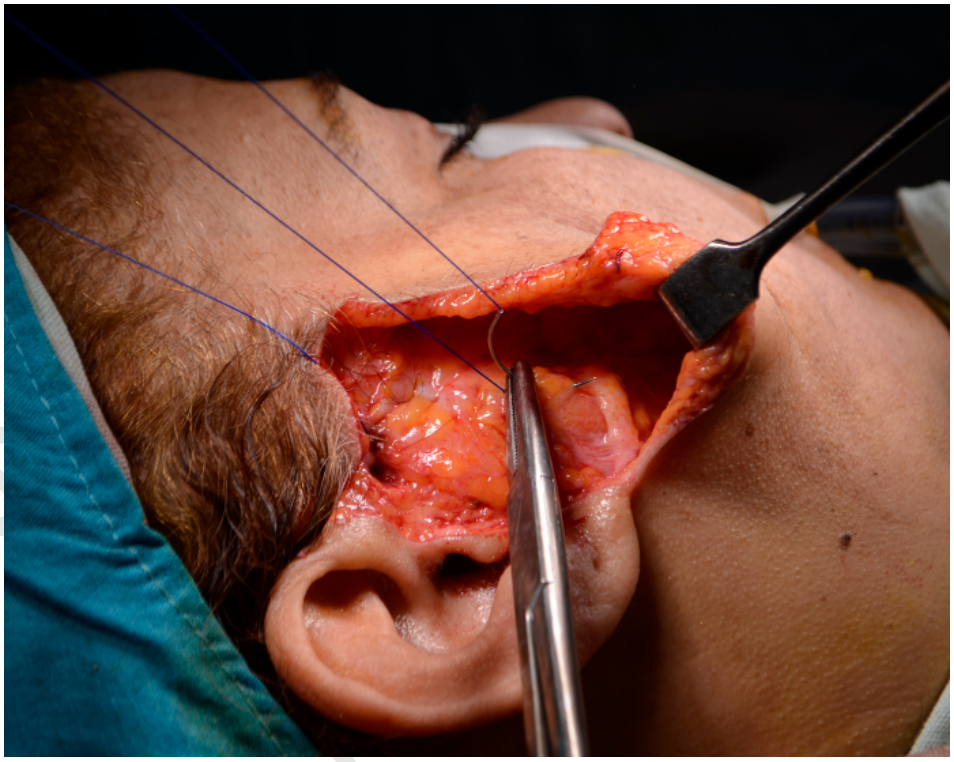

Figure (42): The U suture, the needle bite in the SMAS.

In this region direct visualization by means of a head light or a lighted retractor was helpful. After placing 2 or 3 firm bites in the lateral part of the platysma muscle, the suturing was turned upwards and continued towards the starting point. This created a narrow U-shaped purse-string loop with a width of about 1 cm. Some skin dimples might have to be freed at the borders of the undermining (Figure 43).

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Figure (43): The strong lifting of the neck was clearly evident after tightening of the U suture. Notice the skin dimpling and irregularity that would be freed by further undermining.

II.5. The Second Purse-String Suture: the Oblique Loop

The second suture, the O suture, was then placed. It begins just anterior to the first knot. This suture coursed inferiorly, parallel to the U suture until the edge of the mandible was reached. This purse-string suture continued along the edge of the facial flap undermined anteriorly and then superiorly. Next, it continued posteriorly to encompass the inferior border of orbicularis oculi at the level of the first knot [31,104]. The suture was tied tightly, adjacent to the first suture (Figure 44 and 45). A 4-0 Vicryl suture was used to close the soft tissue over these two buried knots to prevent palpability.

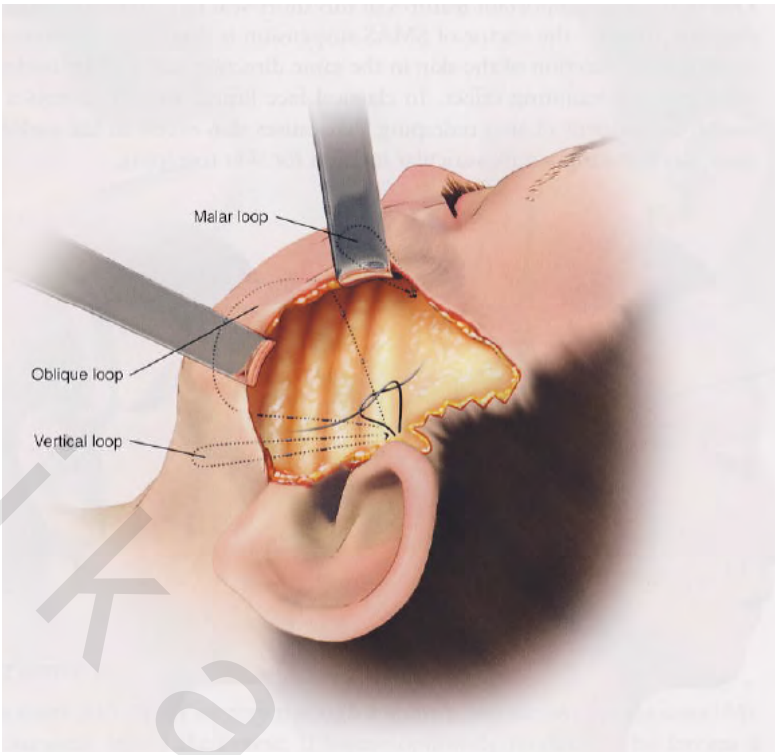

Figure (44): The plication effect of the purse-string sutures (121).

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Figure (45): The lifting of the lower face after tightening the O suture.

II.6. The Third Purse-String Suture:

In extended MACS-Lift, the third suture was then placed. The point of fixation was the deep temporal fascia just lateral to the orbital rim at the level of the upper limbus superior to the lateral canthus [31,104]. The Metzenbaum scissor was used to spread through the orbicularis oculi at this point parallel to the muscle fibers to reach the deep temporal fascia. The suture was then placed secured to the deep temporal fascia at this point, and the purse-string suture was directed to the soft tissues at a level 2 cm directly inferior to the lateral canthus. The suture grabbed the soft tissue and returned back to the point of origin at the deep temporal fascia (Figure 46).

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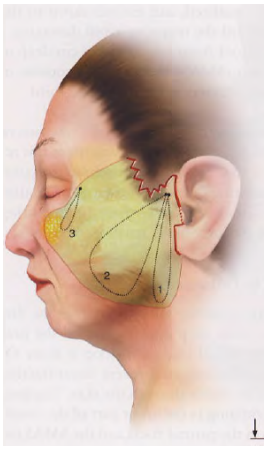

Figure (46): The third suspension suture position in relation to other sutures [121].

II.7. The Fourth Purse-String Suture: the platysma-mastoid suture

In cases represented excessive laxity of the neck region a fourth suspension suture extended from the mastoid periosteum to the platysma was helpful in lifting excess neck tissue [122]. The skin undermining was extended to the postauricular area in the same subcutaneous plane until reaching the mastoid. The suture started from the periosteum of the mastoid process then run forward and downward through the platysma till reaching the lower limit of dissection and return back to the starting point.

II.8. Suction Lipectomy

We preferred to use a 3 mm spatulated cannula, with one opening. The opening was never directed towards the skin to avoid dermal damage [104]. Two or three incisions were used to crisscross the marked area optimally. The lipectomy was performed in a preplatysmal plane under tactile guidance of the non-dominant hand. A maximal lipectomy was performed, so that in the end the cannula is visible just beneath the skin.

II.9. Skin Redraping and Resection

The undersurface of the skin flap was inspected to insure perfect hemostasis. Any bulges that were created by the U and particularly the O sutures were treated with electrodessication and direct trimming to eliminate any bulge or fullness that, although temporary, could be disconcerting for the patient [121]. Any irregularities or adherence of the cheek and/or neck skin following suture tightening might be corrected via scissors spreading to release the skin. Suction drains were placed through a small stab incision in the postauricular sulcus (Figure 47). Drains were usually removed within 48 hours postoperative.

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Figure (47): The suction drain in place.

Demarcation of the highest point of skin flap was done by raising the flap in a vertical direction using two sharp double hooks or Alice forceps fixed at a point at the upper end of the vertical border of the flap and another point at the posterior end of the horizontal border (Figure 48). Then using a scalpel or scissors, cut the skin flap in between the two points until reaching to a fair tension between the skin flap and the highest point in the incision line (Figure 49).

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Figure (48): Raising the flap in a vertical direction using two sharp double hocks.

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Figure (49): Cutting the skin flap with scalpel.

This maneuver resulted in an upward distortion of the earlobe, which was easily addressed by releasing the ear lobe with a back cut incision at the base of the earlobe that allowed proper repositioning (Figure 50). Using Connell's concept, the earlobe was positioned on a line 15 degrees posterior to the mandibular border [77].

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Figure (50): Fixing the skin flap to position by a stay suture. Notice the upward displacement of the ear lobule.

Careful marking for skin trimming were then performed so that the excess tissue was removed and closure could be achieved without tension to create a fine line, high-quality scar (Figure 51 and 52). The pretragal tissue could be defattened using the curved iris scissors. Blunting of the tragus might be avoided to eliminate tell-tale evidence of facial surgery. Closure was then performed using intrupted 4-0 vicryl inverted sutures for subcutaneous layer and continous intadermal 6-0 prolene suture for closure of the skin layer. This suture was removed on the 7th postoperative day.

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Figure (51): Marking of the part to be excised.

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Figure (52): The minimal access wound after excision of the excess skin.

II.10. Posterior cervicoplasty

Posterior cervicoplasty was performed through a 6-cm zigzag-pattern incision designed at the occipital hairline (Figure 53). This zigzag pattern prevented possible dog-ear formation after elliptical excision of the skin excess. The outer legs of the zigzag pattern should be directed toward the skin flap. The area of skin undermining was designed to reach 1 cm beyond the most anterior infralobular skin fold.

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Figure (53): vertical folds when appear in the infralobular region at the end of vertical skin redraping in a MACS-lift procedure. A posterior cervicoplasty would solve this problem (105).

The skin flap was created by scissor dissection at a superficial subcutaneous level, with the course of the greater auricular nerve on the surface of the sternocleidomastoid muscle kept in mind. The skin was redraped in the occipital direction, and the skin excess was excised in an elliptical pattern. After meticulous hemostasis under direct-lighted vision, the skin was closed with buried 4-0 Vicryl sutures and finished with a running 4-0 prolene horizontal suture on a hollow silicone drainage tube.

III. Postoperative Care

In the operating room, the face and hair were carefully washed to remove any trace of bleeding, which is usually minimal. Antiseptic ointment (e.g. Bacitracin) is applied to the incision lines. If suction lipectomy had been performed a light adhesive bandage was applied over the upper neck after surgery.

Often these patients spend the night in our recovery center monitored by our nursing staff. In this setting, no dressings were applied. The overnight nurses could carefully evaluate the entire face and neck for any signs of bleeding or vascular insufficiency.

For outpatients a light head dressing was applied and should be very light, allowing visualization of the cheeks. Patients were usually examined on the first postoperative day. Drains were removed after 48 hours and patients were allowed to bath and shampoo their hair. Suture removal was performed on the postoperative day 7or 8.

Postoperative Instructions:

These instructions were told and given on printed paper to our patients in which we informed them:

A. They would experience swelling of the face, as well as some bruising which might extend into the neck and chest. This is normal and may take 2–3 weeks to disappear completely. Swelling might make the face feel tight. Over the first 3 days, you

might apply ice packs (or bags of frozen vegetables, such as peas, covered with a cloth) to your cheeks for about 20 min every hour [114, 115].

B. Drains would be placed at the time of surgery. These would be removed 48 hours after surgery [123].
C. If you should see bleeding coming through the bandages, please call immediately. You would be given the phone numbers of the surgeon, the surgeon's assistant, and the hospital, if you have any questions. Please do not hesitate to call at any time. In addition, please call if your pain should continue to get worse or if you should experience a fever [124,125].
D. If you had liposuction to the neck, you will notice a very small 2 mm-long incision just under the chin. This would heal without stitches. Normal postoperative swelling and bruising would take several weeks to resolve completely. Over the course of several weeks to months, not only had fat been removed at the time of surgery, but the skin of the neck would progressively tighten and marked improvement will continue to occur. You may perform gentle but firm massage in an upward direction, to both sides of the neck, 2 weeks after your operation [117].
E. Eat a diet consisting of soft food for the first 3 days. You would find it difficult to eat food that requires much chewing. Soups and yoghurts were good examples of soft foods. Drinking fluids through a straw was useful as you do not had to open your mouth too widely.
F. You might wash your hair on the 3rd day after surgery. It is important that the incisions remain dry for 48 h. Do not have a bath for one week after surgery.
G. You should avoid lying flat, and when sleeping, you should be propped up with several pillows. This helps reduce swelling, by allowing gravity to remove fluid from the face [114].
H. You might return to work when you feel able, though many people allow 2 weeks as most of the bruising and swelling would have disappeared by then.
I. Avoid the sun for 3 weeks after surgery as this could increase swelling. After these 3 weeks, please use sun block daily (at least SPF 15) and wear a protective hat. These things are good for the skin in general, as well as to help the healing process after the facelift [115].
J. You should expect to return to see the surgeon about 1 week after surgery for a postoperative visit. At this postoperative visit, as well as inspecting the face and incisions, the surgeon would remove any stitches and skin staples. After this visit, you would also be asked to come see the surgeon after about 6 weeks, to once again check your face and the incisions. If everything was healing well at this point, you might be asked to return for another postoperative visit in 6 months and 1 year's time for a long-term follow-up.
K. For men, because parts of the face might remain numb for the first few weeks, we recommend using an electric razor for shaving. This reduces the chance for cutting the skin and bleeding while wet-shaving.
L. The final result of the surgery would be evident from about 6–9 months after the operation. By this time, the scars will have softened and faded.

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IV. Post-operative evaluation

All patients were followed up for a period of one year through clinical evaluation, postoperative digital photography at known intervals (3rd day, 1st, 3rd, 6th, and 12th month), and subjective and objective assessment of the surgeon and the patient was done.

Post-operative evaluation of results was done using the same pre-operative photographic assessment method, by the division of the face into three regions (middle face, lower face, and upper neck); and classification of the observed laxity into one of six grades, each one with distinctive signs (Figure 30) for each region according to Tables 3-7. After that comparison between pre-operative and post-operative results was done using the suitable statistical analysis.

RESULTS

This study was conducted during the period between January 2012 and December 2013. It included 20 patients suffering from various degrees of facial aging. The patients were operated upon and followed up in Plastic and Reconstructive Surgery Departments of **Alexandria Main University Hospital, Egypt.**

By analyzing the data during this study, the following data were obtained:

I. Demographic data:

I.1. Gender:

All patients included in this study were females as shown in Chart 1.

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Chart 1: Gender distribution of included patients.

I.2. Age:

The distribution of age of patients is shown in Chart 2.

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Chart 2: Age distribution of included patients.

I.3. Occupation

60% of our patients were employees and 40% were unemployed

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Chart 3: Occupation of included patients.

II. Clinical data:

II.1. Pre-operative assessment:

Pre-operative assessment of the 20 patients included in this study was done using clinical and photographic grading as shown previously in patient and methods. Results of this grading are shown in Table 11.

Case No	Middle face	Lower face	Upper neck
1	2	3	3
2	2	2	2
3	4	4	4
4	4	4	4
5	2	3	5
6	1	3	2
7	1	2	2

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8	3	3	4
9	3	4	4
10	2	2	3
11	2	3	5
12	2	3	4
13	3	4	4
14	1	2	4
15	2	2	2
16	2	2	2
17	1	3	2
18	1	2	2
19	2	2	4
20	2	2	3

Table 11: Results of pre-operative grading.

These results showed that for the middle face region 5 (25%) patients had grade 1 aging, 10 (50%) patients had grade 2, 3 (15%) patients had grade 3, and 2 (10%) patients had grade 4 as showed in Chart 4.

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Chart 4: Number of cases pre-operative per grade in the middle face.

In the lower face region the distribution of patients per grade were; 9 (45%) patients had grade 2, 7 (35%) patients had grade 3, and 4 (20%) had grade 4. These results are shown in Chart 5.

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Chart 5: Number of cases pre-operative per grade in the lower face.

In the upper neck region the distribution of patients per grade were; 7 (35%) patients had grade 2, 3 (15%) patients had grade 3, 8 (40%) had grade 4, and 2(10%) patients had grade 5. These results are shown in Chart 6.

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Chart 6: Number of cases pre-operative per grade in the upper neck.

II.2. Post- operative assessment:

In this study MACS-lift face lift operation was utilized to correct the signs of facial aging expressed by our patients. 15 patients undergo correction through a simple MACS-lift, while only 5 patients had an extended MACS-lift. All the patients had neck suction assisted lipectomy, 4 patents needed platysma-mastoid suture, while only 1 patient had done a posterior cervicoplasty.

Post-operative assessment of the 20 patients included in this study was done using clinical and photographic grading as shown previously in patient and methods. Results of this grading are shown in Table 12.

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Case No	Middle face	Lower face	Upper neck
1	1	1	1
2	0	0	1
3	2	1	2
4	1	1	1
5	1	1	2
6	0	1	1
7	0	0	1
8	1	0	3
9	1	1	2
10	1	1	2
11	1	1	4
12	0	1	2
13	1	1	3
14	0	0	2
15	0	0	0
16	1	0	1
17	1	0	0
18	1	0	1
19	1	0	2
20	1	0	1

Table 12: Results of post-operative grading.

These results showed that in the post-operative grading for the middle face region 6(30%) patients had grade 0 aging, 13 (65%) patients had grade 1, and 1 (5%) patients had grade 2 as showed in Chart 7.

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Chart 7: Number of post-operative cases per grade in the middle face.

In the lower face region the post-operative results of patients per grade were; 10 (50%) patients had grade 0 and 10 (50%) patients had grade 1. These results are shown in Chart 8.

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Chart 8: Number of post-operative cases per grade in the lower face.

In the upper neck region the results of post-operative grading were; 2 (10%) patients had grade 0, 8 (40%) patients had grade 1, 7 (35%) had grade 2, 2(10%) patients had grade 3, and 1 (5%) patient grade 4. These results are shown in Chart 9.

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Chart 9: Number of post-operative cases per grade in the upper neck.

Comparison between pre and post-operative grading are shown in chart 10, 11, and 12.

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Chart 10: Comparison between pre and post-operative results in the middle face (No of cases per grade).

Chart 11: Comparison between pre and post-operative results in the lower face (No of cases per grade).

Chart 12: Comparison between pre and post-operative results in the upper neck (No of cases per grade).

The mean percentage of improvement per grade in middle face, lower face, and upper neck regions are shown in Chart 13, 14 and 15.

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Chart 13: The mean percentage of improvement per grade in the middle face.

Chart 14: The mean percentage of improvement per grade in the lower face.

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Chart 15: The mean percentage of improvement per grade in the upper neck.

The mean percentage of improvement in the middle face, lower face, and upper neck is shown in Chart 16.

Chart 16: The mean percentage of improvement in each region.

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II.3. Scar assessment:

Assessment of the face lift short access scar as assessed by doctor and patients is shown in Chart 17.

Chart 17: The scar quality of short access incision.

The next Figures 54-55 show example of the scar quality of different cases.

Figure (54): One-year postoperative detailed view of the preauricular scar. Note the unaltered shape and position of the auricle, avoiding any face-lift stigmata

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Figure (55): Another example of preauricular scar shown excellent results

II.4. Operative time:

The operative time in this study ranged from 2 to 3.15 hours with an average of two and half an hour. Chart 18 shows the number of cases distributed on different groups according to operative time.

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Chart 18: Number of cases per each operative time division.

II.5. Hospital stay

The hospital stay in this study ranged from 1 to2 days with an average of 1.15 days. Chart 19 shows the number of cases distribution according hospital stay.

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Chart 19: Number of cases according to hospital stay.

III. Photographic results:

The next cases were selected to demonstrate different grades of facial aging and the degree of improvement obtained by face lifting by MACS-lift with or without additional procedure/s.

III.1. Case number 1:

Female patient 56-years old with the middle face region showed a nasojugal fold that extends across the midpoint of the cheekbone and a defined nasolabial fold, which correspond to middle facial aging grade 2. The lower face region showed grade 3 changes in the form of jowls that was protruding forward and downward. In the upper neck region there were prominent platysma bands and slightly noticeable horizontal folds, which were corresponded to grade 3 as shown in Figure 58.

Surgical plan included simple MACS-lift with suction assisted lipectomy of the neck, upper and lower blephroplasty. The next Figures 56-63 show photographic documentation of our results.

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Figure (56): Pre-operative photos of case no1.

Figure (57): 1st week post-operative photos of case no1.

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Figure (58): 3rd week post-operative photos of case no1.

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Figure (59): 6th month post-operative photos of case no1.

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Figure (60): preoperative front view compared to one-year postoperative.

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Figure (61): preoperative oblique view compared to one-year postoperative.

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Figure (62): preoperative side view compared to one-year postoperative.

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Figure (63): Minimal access scar one-year postoperative.

III.2. Case number 2:

Female patient 45-years old with the middle face region showed defined nasolabial fold and nasojugal fold that correspond to grade 2 changes. In the lower facial region there was a forward protruding jowls of grade 2, while the upper neck region showed slightly noticeable platysma bands and horizontal folds corresponding to grade 2.

Surgical plan included simple MACS-lift with suction assisted lipectomy of the neck. The next Figures 64-66 show photographic documentation of our results.

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Figure (64): Preoperative front view compared to one-year postoperative.

Figure (65): Preoperative oblique view compared to one-year postoperative.

Figure (66): Preoperative side view compared to one-year postoperative.

III.3. Case number 3:

Female patient 65-years old with the middle face region showed prominent nasolabial fold and nasojugal fold extend to form a flattened area that correspond to grade 4 changes. In the lower facial region there was a forward protrusion with downward sagging of jowls of grade 4, while the upper neck region showed sagging platysma bands and horizontal folds corresponding to grade 4.

Surgical plan included extended MACS-lift with suction assisted lipectomy of the neck, platysma-mastoid suture, and posterior cervicoplasty. The next Figures 67-69 show photographic documentation of our results.

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Figure (67): Preoperative front view compared to one-year postoperative.

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Figure (68): Preoperative oblique view compared to one-year postoperative.

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Figure (69): Preoperative side view compared to one-year postoperative.

III.4. Case number 4:

Female patient 57-years old with the middle face region showed prominent nasolabial fold and nasojugal fold extend to form a flattened area that correspond to grade 4 changes on the right side but showed less prominent nasojugal fold which only crosses the cheek of grade 3 middle face aging changes. In the lower facial region there was a forward protrusion with downward sagging of jowls of grade 4, while the upper neck region showed sagging platysma bands and horizontal folds corresponding to grade 4.

Surgical plan included extended MACS-lift with suction assisted lipectomy of the neck, and platysma-mastoid suture. The next Figures 70-72 show photographic documentation of our results.

Figure (70): Preoperative front view compared to one-year postoperative.

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Figure (71): Preoperative oblique view compared to one-year postoperative.

Figure (72): Preoperative side view compared to one-year postoperative.

III.5. Case number 8:

Female patient 57-years old with the middle face region showed prominent nasolabial fold and nasojugal fold crosses the cheekbone area that correspond to grade 3 changes. The lower face region showed grade 2 changes in the form of jowls that was protruding forward. In the upper neck region there were prominent platysma bands and slightly noticeable horizontal folds, which were corresponding to grade 3.

Surgical plan included extended MACS-lift with suction assisted lipectomy of the neck, platysma-mastoid suture, and lipofilling of the malar and temporal regions. The next Figures 73-75 show photographic documentation of our results.

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Figure (73): Preoperative front view compared to one-year postoperative.

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Figure (74): Preoperative oblique view compared to one-year postoperative.

Figure (75): Preoperative side view compared to one-year postoperative.

III.6. Case number 9:

Female patient 62-years old with the middle face region show less prominent nasojugal fold crosses the cheek of grade 3 middle face aging changes. In the lower facial region there was a forward protrusion with downward sagging of jowls of grade 4, while the upper neck region showed sagging platysma bands and horizontal folds corresponding to grade 4.

Surgical plan included extended MACS-lift with suction assisted lipectomy of the neck, platysma-mastoid suture, and Rhinoplasty. The next Figures 76-78 show photographic documentation of our results.

Figure (76): Preoperative front view compared to one-year postoperative.

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Figure (77): Preoperative oblique view compared to one-year postoperative.

Figure (78): Preoperative side view compared to one-year postoperative.

III.7. Case number 10:

Female patient 54-years old with the middle face region showed defined nasolabial fold and nasojugal fold that correspond to grade 2 changes. The lower face region showed grade 2 changes in the form of jowls that was protruding forward. In the upper neck region there were prominent platysma bands and slightly noticeable horizontal folds, which were corresponded to grade 3.

Surgical plan included simple MACS-lift with suction assisted lipectomy of the neck. The next Figures 79-81 show photographic documentation of our results.

Figure (79): Preoperative front view compared to one-year postoperative.

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Figure (80): Preoperative oblique view compared to one-year postoperative.

Figure (81): Preoperative side view compared to one-year postoperative.

IV. Complications:

Only one case of our patient (case no 20) suffered from small postoperative hematoma on the right side of the face. This hematoma was evacuated by needle aspiration leaving no sequele on the results of this case.

Another case (case no11) in our study showed complication in the form of obvious or unsightful preauricular scar as shown in Figure 81.

Figure (81): Complicated preauricular scar makes it obvious.

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