Face and neck lifts: SMAS vectors for support and smile crease correction

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The plastic surgeon undertaking face and neck lifts needs a precise vision of the end result, a specific anatomical diagnosis and a precise plan of repair. Using concepts which have evolved over the years, techniques can be applied to treat patients of all ages for rejuvenation and re-entry into the job market.

Key Words: *Face lifts, Facial rejuvenation, Neck lift, Open liposuction, SMAS, SMAS support vectors, Smile creases*

Lifting du visage et du cou: vecteurs SMAS pour le support et la correction des rides du sourire

RÉSUMÉ: Le chirurgien plasticien qui entreprend un lifting du visage et du cou doit avoir une idée précise de l'issue de l'intervention, un diagnostic anatomique détaillé et un plan de réparation minutieux. À l'aide de concepts qui ont évolué au cours des ans, des techniques peuvent être employées pour traiter les patients de tous âges et rajeunir leur apparence afin de les préparer à réintégrer le marché du travail.

The fundamentals of advancing the quality of results of facial rejuvenation depend on three concepts:

- The layers of deep support, including submuscular aponeurotic system (SMAS) and platysma muscle, almost always need to be shifted in directions different from the skin shift for the best quality result.
- Precision supportive vectors can be directed to problem areas by division of the SMAS and platysma muscle in special ways to make extensions of these tissues, provide precision in support and reach immobile firm fascia.
- Supportive vectors must be planned to permit improvement during changes in position of the head and neck.

Skin relaxation and positional stress on the supportive tissue of the deep layers and the skin while looking straight ahead, reclining, looking downward and taking part in sports determine the planning of dynamic support for rejuvenation (Figure 1). Plastic surgeons now have the ability to rejuvenate the face without producing objectionable hair displacements or unsightly scars which limit social and sport activities. Therefore, attention can now be directed to improving the quality of results, which produces an increased demand for rejuvenation procedures. There is no uniform approach to deep facial rejuvenation; nevertheless, surgeons are able to

recognize the anatomical basis of the patient's problem and can apply logic and careful planning to select appropriate techniques which are safe, effective and reasonable. This paper presents several of the techniques for deep layer rejuvenation which have delivered satisfaction to many patients. Before deep layer techniques were used, procedures to overcome the shortcomings of facelift techniques included frequent use of facial liposuction, malarplasty, submalarplasty, prejowl mandibular implants and facial fat injection. These techniques are sometimes indicated in specific circumstances; however, in the majority of cases they will be unnecessary if deep layer rejuvenation is used. Repositioning of ptotic cheek tissue, with precision vectors of deep layer support, and modification of the restraining ligaments of the face, malar and submalar prominence, can be restored; nasolabial folds can be improved, and jowl fullness eliminated both when the patient is looking straight ahead and when looking downward when seated at a desk or reading. Anterior neck bands and submental fullness are also deep layer problems, and tightening of skin flaps over sagging muscle, ptotic glands and submental fat does not produce satisfactory improvement.

Contemporary techniques use the skin as a covering, not a supportive element. Ignoring the fact that skin will readjust its collagen and elastic fibres when placed under stress can avoid unnatural appearances. When using deep layer procedures, only redundant skin is excised, and closure can be made under skin tension which is close to normal (Figure 2). Tension increases when the patient opens his/her mouth and

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Figure 1A) Arrows indicate the directions required for maximum improvement by shifting the deep layers of the face. The direction must be a compromise because when the patient is looking straight ahead (**top**), the directions in which the deep tissue are to be shifted go in a posterior-superior direction for the upper part of the nasolabial fold; for the submental area the direction needed is more superior, and for the main part of the neck, more posterior-superior (**bottom**)

Figure 1B) This 57-year-old patient is gazing down at a book on her knees (**top**). The standardized position with the hips and the back touching the chair and the heels on the floor, and the same book, were used to take a postoperative photograph one year later (**bottom**). This view is the most important view for assessing postoperative face lift results. If the patient looks good in this view, they will look good in any other view

Figure 1C) Face and neck lift (**top**) with deep layer support was combined with correction of the upper and lower eyelid excess skin and fat. The diagonal view (**bottom**) shows the improvement approximately one year after surgery

when looking downward. However, when the patient is seated and looking straight ahead, skin tension following surgery is only slightly increased over normal.

MODIFICATION OF THE SMAS AND PLATYSMA

The plan for deep layer modification will depend upon the deformities present and will necessarily vary from patient to

patient. Except for the unusual circumstance in which superficial ageing only has occurred, almost all patients will benefit from a posterior-superior advancement and rotation of the mid-face SMAS above a pivot point situated over the anterior-medial malar eminence. This should provide improvement in the cheek and jowl and consolidate the lower face (Figure 3). Patients with anterior platysma muscle bands but no general-

Figure 2) Blue marking shows the extent for this patient for the correction of the crow's feet, exposure of the SMAS, and neck improvement

ized muscle laxity (cervicomental obtusities) and good definition over the lateral mandibular border are best treated by some form of localized anterior muscle interruption and release. The result is immediate, dramatic and long lasting. Patients with lateral bands, generalized muscle laxity or poor definition over the mandibular angle and border will require more extensive or even complete division of the platysma.

Anterior bands are treated by transecting the platysma from jugular vein to jugular vein at the level of the cricoid cartilage. If lateral bands are present, this transection is carried more laterally to include them as well. If, in addition to anterior and lateral bands, poor definition is present over the lateral mandibular border or angle, platysma muscle transection is carried full width superior-laterally along the anterior border of the sternocleidomastoid muscle and in continuity with the SMAS incision overlying the parotid (Figure 1B). A similar full width transection would be used to treat an obtuse neck with poor mandibular definition but no bands. Medial wedge resections at the hyoid and vertical excisions of anterior bands are unnecessary if the above techniques are employed.

If submental support is poor or maximum improvement in the submental region is desired, anterior submental suturing is performed (Figure 1B). This should always be done after

Figure 3) Diagram showing the architectural planning for a three-component SMAS with the upper flap rotated to extend to firm temporal fascia for support of the upper third of the nasolabial fold. The central larger flap will be shifted in a superior-posterior direction to give support to the midportion of the nasolabial fold as indicated by the arrows and gives support to the tissues extending under the submental area of the neck. A flap will be transposed from the SMAS anterior to the ear to extend to the fascia of the mastoid to give support directed with precision to the area around the hyoid cartilage as indicated by the arrow in the upper part of the neck

elevation of the cheek SMAS to prevent compromised improvement on the mid-face and jowl. When muscle redundancy is large, excess platysma is excised medially and the medial borders approximated edge-to-edge. If platysma redundancy is small, only a midline invagination may be needed.

When mild horizontal muscle redundancy is present in the neck, lateral platysma suturing is performed. This is usually effective only over the upper quarter of the sternocleidomastoid muscle where its fascia is immobile. In thin necks, the cut muscle edges are overlapped and sutured. In larger necks, they are trimmed and sutured edge-to-edge. Suturing over the lower portion of the sternocleidomastoid muscle is generally unproductive and may lead to distortion and irregular contours.

When horizontal redundancy is large or maximum improvement in cervicomental obtusities is desired, a postauricular transposition flap of cheek SMAS is used (Figure 3). If properly designed, this flap will provide dynamic reinforcement of the upper neck and submental areas when the patient looks down. This flap is also useful in some patients who do not require platysma transection or wide subcutaneous undermining, but who would benefit from increased support of the anterior neck.

If a large or heavy nasolabial fold is present, a separate SMAS flap is planned to allow an independent vector advancement of ptotic malar fat. This flap is created by separating the superior portion of the cheek SMAS flap that is attached to the ptotic tissue in the nasolabial region (Figure 3). It is then sutured securely to temporal fascia or malar periosteum. A longer flap, if needed, can be created by back cutting inferiorly into the cheek SMAS flap parallel to the preauricular margin.

PLANNING MODIFICATION OF THE SUBMENTAL REGION

Traditional facelift techniques do not address deep layer ageing in the submental region and cannot correct significant problems due to subplatysmal fat accumulation, submandibular salivary gland ptosis and digastric muscle hypertrophy.

Abnormal collections of subplatysmal fat are identified by preoperative palpation of the neck with and without platysma action. Fat lying predominantly in a preplatysmal position will be palpable even upon muscle activation, whereas fat lying in a subplatysmal position will not. Subplatysmal fat accumulations are typically present in patients troubled by lifelong cervicomental obtuseness, and preplatysmal lipectomy alone may produce only modest improvement. In these individuals, partial subplatysmal lipectomy may be productive, but complete removal of all subplatysmal fat is never indicated. The decision to perform partial subplatysmal lipectomy cannot be made preoperatively and should be deferred until the effect of SMAS shift and preplatysmal fat removal are examined.

Preoperative assessment must be made of the submandibular glands as they frequently contribute to the appearance of a full neck. Large or ptotic glands are frequently hidden by submental fat or lax platysma muscle and a plan that does not recognize this fact may lead to disappointment and unexpected bulges in the upper neck postoperatively. Experience has shown that the platysma contributes only partially to the support of the submandibular gland and attempts at tightening, plication and imbrication are usually ineffective and short lived. Careful sculpting of the periglandular fat will sometimes disguise small glands, but larger glands may require partial resection. Submandibular gland resection should always be discussed preoperatively with the patient. This procedure will produce prolonged submental induration and edema and carries a remote risk of a salivary fistula or dry mouth symptoms.

A small minority of patients will present with large, bulky anterior digastric muscles evident as midline submental fullness. In these individuals, partial muscle resection may be considered if suboptimal improvement is produced by cervicosubmental lipectomies, submandibular gland resections and submental platysmaplasties. This decision should be deferred until the day of surgery and the improvement produced by other modifications of the submental region have been observed.

CORRECTION OF CROW'S FEET (SMILE CREASES OR PATTES D'OIES)

The smile creases which produce an aged appearance lateral to the eyes and extending frequently into the upper and lower eyelids is a deep layer problem that is not adequately treated by superficial dermabrasion, peeling or unusual facelift techniques. It is best to consider rejuvenation in all areas at one time, since doing one area only may make another area look relatively older. Considerable improvement is possible in patients in whom orbicularis oculi muscle hypertrophy contributes significantly to the problem. A more modest

improvement is obtained in those patients with predominantly intrinsic changes in the skin.

A precise delineation of the deformity and careful assessment of the contribution of muscle hypertrophy is necessary to obtain a good result. Good candidates are identified by asking them to smile broadly and assessing the degree of orbicularis hypertrophy present. Those with obvious thickening will obtain the most improvement. In many cases, a thick muscle band can be seen in the lateral orbital region near the lateral canthus.

If correction is planned, all creases are marked preoperatively and close-up photographs taken of both the relaxed and smiling lateral face. Good photographs should include the corner of the mouth so that fair comparisons can be made at a later date (Figure 3). Markings should be made along the entire length of each crease and include any extensions lying medial to the lateral orbital rim, superiorly on the lateral brow and inferiorly on the lower lid and cheek. This ensures complete release of all dermomuscular attachments at the time of surgery.

Correction of the 'crow's feet' deformity encompasses five straightforward steps but demands a commitment of the surgeon's energies and additional operating room time (Figure 4). These steps include marking the deformity, cutaneous undermining and release of dermomuscular attachments, lateral interruption of the orbicularis sphincter, contouring the cut muscle edges and redraping the regional skin.

The correction is begun by undermining all skin of the temple and lateral orbital region that has been preoperatively marked. This dissection must be carried out carefully to avoid 'buttonholing' the skin or injuring the muscle fascia. It is somewhat tedious due to oozing from small muscular perforators. Unlike other techniques described elsewhere, all undermining is superficial to the orbicularis oculi muscle and the orbicularis itself is not elevated. The patient, if awake, is asked to smile to confirm release of all attachments.

A methylene blue line is then drawn laterally and slightly inferiorly on the orbicularis oculi muscle from the medial fibres in the region of the lateral canthus to the lateral limit of the sphincter. Muscle only is divided along this line with small scissors, taking care to avoid injury to the frontotemporal branch of the facial nerve. In most cases, the cut muscle edges must be bevelled to avoid a visible step-off or irregular contours. Careful observation after redraping of the lateral orbital skin will assure completeness of this interruption and usually demonstrates a pleasing improvement in upper cheek contour.

PLANNING OF DEEP LAYER SUPPORT MODIFICATIONS

A key step in planning SMAS incisions is selecting the malar pivot point upon which the flap will rotate. This point must be chosen individually for each side of the face and its location will vary depending on the degree of midfacial laxity and whether nasolabial fold correction is indicated. As a rough guide, it will lie approximately one-and-a-half to two finger breadths inferior to the lateral canthus in the face with

Figure 4) This woman, in her early sixties, has a corrugator component to her orbicularis oculi muscle which shows a striking improvement following surgical correction of her smile crease (crow's feet) at the same time that she had a face lift

an insignificant nasolabial fold. If nasolabial fold correction is needed, this point must be moved medially, well anterior to the malar origin of the zygomaticus major muscle, to insure complete release of the anterior zygomatic ligaments.

Once the proper location of this point has been determined, a methylene blue line is traced laterally over the lower third of the zygoma and zygomatic arch to a point approximately 1 cm anterior to the superior aspect of the tragus. This line is then turned inferiorly and carried over the parotid and along the sulcus in front of the ear. At the inferior border of the parotid the mark continues inferiorly and posteriorly to the anterior border of the sternocleidomastoid muscle. A basic flap of this design is used on almost all patients.

If poor definition is present over the lateral mandible, this incision is continued 'full width' along the anterior border of the sternocleidomastoid muscle to the level of the cricoid cartilage. The mark is then turned anteriorly and transversely to join a line of similar design on the opposite side if anterior or lateral bands or both are present. A full-width transection may also be indicated in an obtuse neck with poor definition over the mandibular angle but no bands.

This design encompasses several important points worth considering. By placing the flap rotation point over the malar region, fullness gained during rotation ('dog ear') is con-

verted to a subtle but significant augmentation of this area. Similarly, advancement of cheek SMAS over the zygomatic arch restores skeletal projection there. By carrying the incision posteriorly and inferiorly from the tail of the parotid to the anterior border of the sternocleidomastoid muscle, a 3 to 4 cm 'safety zone' from the mandibular margin is maintained. This moves the dissection well away from the marginal mandibular nerve in almost all cases. Placing the remaining portion of the incision, when indicated, a few millimetres anterior and parallel to the anterior border of the sternocleidomastoid muscle keeps the dissection in a relatively thin and avascular area of platysma and along a line where the cut edge, if visible postoperatively through the skin, would appear as the muscle border. Furthermore, by transecting the platysma low in the neck at the level of the cricoid, and not the hyoid, accentuation of the larynx is avoided and a smooth transition from neck to submentum is preserved. Support of the submandibular glands is also maintained and, because the muscle is thin at this level, the cut edges rarely require bevelling nor appear unexpectedly as visible transverse ridges postoperatively.

Tracing the SMAS and platysma incisions generously with methylene blue will ensure that each edge of the flap when cut will be marked and easily identified later in the procedure.

Figure 5) Result of a two-component SMAS support with the upper part sutured to the temporal fascia and the central portion sutured to the SMAS in an upward and backward direction. Notice the support extending to the vermilion of the upper lip as well as the lateral ala

The first incision in the SMAS is begun just anterior to the tragus and carried medially over the zygomatic arch. Traction placed posteriorly on this layer with two Allis clamps will make the dissection easier since scissors will tend to follow the tense plane. The dissection should be kept as superficial as possible, especially over the course of the frontotemporal branch of the facial nerve and the zygomatic muscles. The vertical limb of the incision overlying the body of the parotid is then made in a similar manner, beginning anterior to the tragus and continuing inferiorly while traction is applied superiorly. SMAS flap elevation is then begun.

The assistant should apply gentle posterior traction on the SMAS flap with two Allis clamps to stabilize it and facilitate dissection. It can then be carefully elevated, usually with Metzenbaum scissors, using a combination of careful sharp and blunt technique until motion at the philtrum, corner of the mouth and upper nasolabial fold is produced with a small tug superiorly upon it. This does not require an extensive sub-SMAS dissection across the cheek and face because most restraining fibres lie just anterior to the zygomaticus major muscle origin (anterior zygomatic ligaments) or along the anterior border of the parotid. The extent of undermining is

thus not arbitrary, but is continued until the desired effect is obtained (Figure 5).

The SMAS is thinner and more fragile than many surgeons imagine it to be and most certainly thinner than galea, fascia lata, rectus sheath or other layers typically dissected in plastic surgery procedures. Elevation can be safely begun over the parotid in all cases, but great care must be taken when dissecting over the zygomatic arch and anterior to the anterior border of the parotid. Sharp dissection is generally required over the parotid where the plane between parotid fascia and SMAS is indistinct, and in many instances a few lobules of the gland are exposed. This is of no consequence. A distinct plane does exist, however, between the SMAS and platysma and the parotidomasseteric fascia. This plane can usually be entered by gentle vertical spreading with scissors' tips. The parotidomasseteric fascia below it will appear as a thin, shiny layer covering the masseter, parotid duct, buccal fat and the buccal branches of the facial nerve. Dissecting with care above this layer is safe and will not result in nerve injury, but great caution must be exercised when clamping or coagulating in this area. Frequently, nerve branches accompany perforating vessels and cauterization should be discontinued medially if facial twitching is noted. For similar reasons, blind clamping in this region must also be avoided.

As dissection proceeds anteriorly and medially over the zygoma, the SMAS will split into an anterior and posterior leaf, which envelope the zygomaticus muscles. At this point the dissection must be forced superficial to the muscle, but beneath the superficial leaf of overlying SMAS. Just medial to the bony origins of these muscles, the anterior zygomatic ligaments will be encountered. These may be divided and will result in liberation of the flap.

Once elevated and sufficiently released, the posterior superior edge of the SMAS is grasped by Allis clamps and the flap shifted variously to determine which direction produces the best result. If additional support is needed in the nasolabial area or submental region, the flap should be bifurcated or trifurcated to provide superficial pull along with separate vectors by separating either the superior or posterior edges or both, as appropriate. If segmentation of the SMAS flap is not indicated, the flap is shifted to produce the desired effect and its superior margin is then sutured to the superficial temporal fascia with 4-0 nylon mattress sutures. Care should be taken to avoid suturing along the course of the frontotemporal branch of the facial nerve. No trimming of the superior margin of the SMAS is performed in many cases, as the overlapping segment augments the zygomatic arch and restores lost projection there. In certain faces, in which the midface is wide and the mandible small, this effect may not be desired. In these cases the superior flap margin may be trimmed to fit, the excess discarded and the cut edges sutured end-to-end. In other faces in which submalar atrophy is advanced, or in cases in which the SMAS is extremely thin or fragile, the superior edge of the flap may be folded inward upon itself and the folded edge sutured directly to the cut edge above it. This will result in a subtle but significant augmen-

tation of the submalar region and a double thickness of tissue to suture to.

In patients in whom additional improvement is needed in the nasolabial area, the superior margin of the SMAS flap may be separated from the tissue inferior to it but left attached to the cheek fat and medial-most portion of the midface. This flap can be advanced along with an independent vector to produce optimal improvement in this area. In most cases it is long enough to be sutured safely to the immobile portion of the temporal fascia well posterior to the course of the frontotemporal branch of the facial nerve. If not, a longer flap can be created by back-cutting along the posterior margin of the cheek. If a long flap cannot be constructed, or augmentation of the upper lateral midface is not desired, a shorter flap may be used. It is secured by suturing it to the deep tissue and periosteum overlying the anterolateral malar region. This will not produce deformities or irregularities in this area.

Some trimming of the posterior margin of the cheek SMAS flap is usually required to allow an edge-to-edge closure to the SMAS remnant in the preauricular region. After trimming, the cut edges are approximated with multiple interrupted inverted sutures of 4-0 nylon. These sutures will prevent 'derotation' of the flap and reinforce the superior suture line. Overlapping the cut edges of the SMAS and the malar region, though useful, is ill-advised in the preauricular area. Overlap here will result in unnatural preauricular fullness and obliteration of the pretragal hollow. These are tell-tale secondary deformities to be avoided.

When additional support is needed in the superior neck and submental region, the excess tissue along the posterior margin of the cheek SMAS flap can be left attached to the cervicosubmental platysma and used as a postauricular transposition flap to further improve neck contour. This flap improves neck contour by correcting horizontal platysma redundancy and increasing submental support. Frequently, this cannot be accomplished by lateral platysma suturing alone, due to mobility of the tissue in the upper lateral neck (Figure 3). Suturing the transposed segment of cheek SMAS to the mastoid fascia, while leaving it attached to the submandibular-suprahyoid platysma, circumvents this problem. In addition, a dynamic sling is produced that actually tightens the submental region when the patient looks down. This occurs because the mastoid moves superiorly during neck flexion and away from the anterior neck pulling the transposed flap, and its attachments, with it.

The postauricular transposition flap is useful in providing added support to the submental region when the anterior neck is not fully undermined, when anterior submental platysma suturing is inadequate or when a submental incision is to be avoided. Furthermore, it can be designed to provide selectively directed support to specific problem areas depending upon how low it is released and to what it is left attached. In some necks it may be designed to pull chiefly on the submental region to improve support there. In others it may be dissected lower and its pull directed along the cervicomental angle to accentuate the suprahyoid notch.

When a postauricular transposition flap is used, it must be carefully designed and its effect thoroughly tested. Suturing should be performed with the cervicomental angle 90° or less to avoid extensive tension upon neck flexion postoperatively. Suturing to the mastoid is performed with mattress sutures of 4-0 nylon. Usually the more proximal portions of the flap are sutured with interrupted suture of 4-0 chromic. This prevents it from rolling upon itself and forming a palpable roll in the postauricular and infra-auricular areas.

DRESSINGS

Face lift dressings of large size and moderate size are used by many surgeons who claim that it may prevent edema, oozing, seromas and hematomas; however, when carefully questioned, most surgeons do not believe this to be true. However, others claim their dressings provide increased patient comfort and improvements in neck contour. Logic and careful evaluation argue against these ideas.

Many rational arguments against the use of neck and face dressings exist. These include danger of compressing delicate skin flaps which have been widely undermined, interference with venous and lymphatic flow and obstruction of arterial flow over bony prominences. A concealed hematoma may expand under a large dressing. A large neck or face lift dressing is uncomfortable. Most are tight, confining, obstructing and may cause skin irritation with motion. A pillow placed behind the head may cause venous and lymphatic obstruction.

If a dressing is used to keep blood spots off the pillow, it should be loose and should not cover the face or neck. A small wrap of gauze will cover the hair and prevent spots on the pillow from oozing of the incisions. This is removed within one to two days when drains are removed. The patient may wash his/her hair on either the first or second postoperative day.

POSTOPERATIVE CARE

Postoperative care is very important to the final result in face and neck rejuvenation. Patients are looked after by an aftercare specialist who is experienced in the postoperative plan required by our clinic. A physician is available at all times to answer questions and to see the patient if needed.

All patients have their entire incision line examined the morning after surgery. If the drain reservoir has no more than 30 mL, the drain is removed. If there is more than 40 mL, the drain is always left. Any sutures that appear tight are snipped and left in place. This prevents alopecia by suture pressure, prevents superficial necrosis and usually does not produce bleeding from the suture site, which might occur if the suture were completely removed. Any signs of compromise in the postauricular flaps are an indication that the patient has not been keeping the shin-neck angle greater than 90° . Patients are shown how to sit and eat and are forbidden to hold a book or magazine in their hands or in their lap. They are instructed to not sit upright without a head rest; if they lean forward they are told to put their elbows on their knees, adopting a position

that ensures an open cervicomenal angle while reading with a book placed on a coffee table or a chair.

Poor arterial supply to the postauricular flap is rarely seen. If this occurs, the offending sutures are removed immediately. Postoperative instructions are given at the last preoperative visit, and are reviewed at each postoperative visit with the patient and with the person who must be a companion for the first nine days after surgery. Patients are not allowed to drive for nine days. If patients have had a deep layer support procedure, they are reminded that their dental occlusion is expected not to be normal until approximately six weeks following deep layer surgery.

Sutures are removed from the eyelids approximately four days after surgery, and approximately six days after surgery the small sutures are removed. Areas of maximum tension

such as the temporal area, that is under tension when the patient opens his/her mouth, and the occipital area are left approximately seven to eight days.

Patients are expected to shampoo their hair daily after the drains have been removed for the first two weeks after surgery.

The use of SMAS vectors for facial rejuvenation and for smile crease correction go hand in hand. When the results show striking rejuvenation at rest, but when the patient smiles and looks 15 years older because of the smile creases, the result is not as good as it could have been. There are many patients who do not need smile crease correction; nevertheless, there are some whose appearance could be much better if deep layer support is done as well as excision of excess skin (Figure 1C).

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