Surgical and non-surgical methods in facial rejuvenation

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List of Abbreviations

SMAS	Superficial MusculoAponeurotic System
MACS lift	Minimal Access Cranial Suspension Lift
HA	Hyaluronic Acid
FDA	Food and Drugs Association
pH	Potential of Hydrogen
ASCs	Adipose-derived Stem Cells
SVF	Stromal Vascular Fraction
NSAIDs	Non-Steroidal Anti-Inflammatory Drugs

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Summary

Title: Surgical and Non-Surgical Methods in Facial Rejuvenation

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As we accept cosmetic surgery in to the norm of our society, patients strive to look younger and younger, it seems like they are reaching to capture eternal youth. This article reviews the impact anatomy of the face has on surgical correction. We will look closer at the history and advancements of various facelift techniques in aesthetic surgery. The surgical techniques are: the Subcoutanous Face Lifts, the Superficial MusculoAponeurotic System (SMAS) method, the Deep plane method, and Minimal invasive & Non-Invasive Methods. The Non-surgical techniques are: the Minimal Access Cranial Suspension Lift (MACS) lift, the Volumetric Methods, Hyaluronic Acid (HA) fillers, and Autologous Fat Grafting. Finally, this review discusses potential postoperative complications that can happen after cosmetic face-lift surgery. There is debate over which approach is more favorable and future research is needed to better illustrate the best treatment options, which may very well be based on the patient themselves.

Keywords: ■ Subcutaneous Face Lifts ■ SMAS method ■ Deep Plane Method ■ Minimal invasive & Non-Invasive Methods ■ Volumetric Methods ■ Hyaluronic Acid Fillers ■ Autologous Fat-Grafting ■

Sažetak

Naslov: Kirurške I Nekirurške Metode Pomlađivanja Lica.

Autor: Shahab Allahyari

Kako prihvaćamo estetsku kirurgiju u normu našeg društva, tako pacijenti nastoje izgledati sve mlađe, te se čini kao da hvataju vječnu mladost. Ovaj članak pregledava utjecaj anatomije lica na kirurške korekcije. Pobliže ćemo promotriti povijest i napredovanje raznih tehnika zatezanja lica u estetskoj kirurgiji. Kirurške tehnike su: Subkutani Liftovi Lica, površinski mišićni aponeurotični sustav (SMAS), facial fascia level metoda, i minimalno invazivne i neinvazivne metode. Ne-kirurške tehnike su: podizanje kranijalne suspenzije minimalnog pristupa (MACS), volumetrijske metode, injekcije hijaluronske kiseline (HA) i autologno premještanje masnoća. Naposlijetku, ovaj pregled govori o potencijalnim postoperativnim komplikacijama koje se mogu dogoditi nakon kozmetičke operacije lica. Postoji rasprava o tome koji je pristup povoljniji i potrebno je daljnje istraživanje kako bi bolje ilustrirale najbolje mogućnosti liječenja, koje bi se također mogle temeljiti i na samim pacijentima.

Ključne Riječi: ▪ Subkutani Liftovi Lica ▪ Površinski Mišićni Aponeurotični Sustav (SMAS) ▪Facial Fascia Level Metoda ▪ Minimalno Invazivne i Neinvazivne Metode ▪ Podizanje Kranijalne Suspenzije Minimalnog Pristupa (MACS) ▪ Volumetrijske Metode ▪ Injekcije Hijaluronske Kiseline (HA) ▪ Autologno Premještanje Masnoća ▪

1.0 Introduction

Throughout human history, man has always strived for ways to capture eternal youth. With the technological advances made in recent decades, we are getting closer and closer to reach this goal. Our focus will be on surgical and non-surgical methods in facial rejuvenation. Currently there is no guide lines nor any consciences for which procedures is best for the patients, considering the patients age, sex, ethnicity, genetics, anatomy, etc. Here is an attempt to show you a few methods that can be considered if one wants to chase that dream of staying forever young. We will look closer at the history and advancements in aesthetic facial reconstruction. We will compare the pros and cons of the methods being used today. The surgical techniques that we will focus on are: The Subcutaneous Face Lifts, the Superficial MusculoAponeurotic System (SMAS) method, the Deep plane method, and Minimal invasive & Non-Invasive Methods. The Non-surgical techniques consist of: The Minimal Access Cranial Suspension Lift (MACS) lift, the Volumetric Methods, Hyaluronic Acid (HA) fillers, and Autologous Fat Grafting. We are also going to look closer at the complications that can follow a surgical or non-surgical procedure.

2.0 History & Advancement

In the last one hundred years we have seen a significant increase in facial esthetic surgery, not only in the number of procedures but as well in the quality of surgeries. Consistent improvement in surgical techniques as well as treatment strategy have grown naturally out of a better understanding of the aging process as well as the anatomical structures of the face. Facial aging is a multi-factorial process involving the skin, facial skeleton, and soft tissues. There are few surgical procedures that have seen so much improvement in the last 100 years as facelifts have. Facial aging is a multifactorial process involving the facial skeleton, soft tissues, and the over lying skin. Collagen loss, dermal elastosis, and epidermal thinning all contribute to the rhytides of the skin [1]. The morphological basis of aging is created by the remodeling of the facial skeleton [2,3]. As the bony maxilla ages there is a posterior retrusion that leads to a blunted midface and also loss of support for the periorbital tissues [2,3]. If there is a hypoplastic maxilla and an inherently prominent globes that will have a ¨negative vector¨ relationship where the globes will project anterior to the malar eminence, creating an environment for lower lid laxity, sagging cheeks, and a prominent tear trough [4,5]. Even though the skeleton of the face generates the morphologic basis of aging, bony manipulation or augmentation is limited in facial rejuvenation surgery. Rather, it is the envelope of the soft-tissue that surgeons primarily work on in a face lift [6].

Soft tissue ptosis, as a result of ligamentous attenuation, bony retrusion, or volume deflation will lead to the deep creases of the aging process of the face and this is the target of surgical correction. Esthetic surgery is relatively common and socially acceptable in today's society, but in the beginning of 20th century this was not the case. At that time the American medical community attempted to ban cosmetic surgery [7]. The surgeons that where performing these operations had to do so in private clinics or purposely mis-label cases on operative logs to avoid detection. Because of this there weren't any publications on surgical techniques for many years, due to this reason the true origin of esthetic procedures is unknown. What we do know is that surgeons both in Europe and America were performing early facelift techniques by the early 1900s. Eugene von Hollander is often credited as the first surgeon to have performed facelifts, stating in 1932 that his original operation was performed on a Polish aristocrat in 1901 [8]. Doctor Hollander first mention that he had performed such procedure in the chapter entitled ¨Cosmetic Surgery¨ in 1912, even though he didn't mention the actual date of the operation until many years later. He also discussed making elliptical skin excisions in natural skin folds near the hairline and ears [9]. Other surgeons like Joseph, Passot, and Bourget described similar techniques involving elliptical excisions to treat the aging face around the same time [10-12]. Bourget, however, was the first to describe subcutaneous dissection with undermining, as well as fat excisions to correct periorbital fat pads [13]. Facial rejuvenation innovations really start gaining traction around the time of World War 1. The wake of World War 1 started to see the higher demand for reconstructive surgery, which also provided the foundation for facelift. As well as wealth of Americans, an increase in surgeons, and the increase in quality of anesthesia contributed to the evolution of facelift techniques [14]. At this point more surgeons start publishing their techniques. Noel was a surgeon that published a book describing facialplasty, blepharoplasty, and forehead and neck lifting in a 1926 [15]. Bettman described a continuous temporal scalp, postauricular, preauricular, and mastoid incision that is similar to the cutaneous incisions made in the standard facelift procedures today, and that was in 1920 [16]. Many years later in order to compensate the limitation of the subcutaneous facelifts surgeons began addressing the deeper tissues. Aufrict first started to suture the deeper structures to the superficial fat in 1960 [17]. Skoog was credited with the first depiction of facelift that included dissection of the deeper fascial layers, he also described dissections of the superficial fascias of the face, which he named ¨buccal fascia¨ which is a continuation of the platisma of the neck. After the dissection the flap is repositioned in a superioposterior direction and secured to the parotidomasseteric and mastoid fascia with a small suture [18]. In 1976, Peyronie and Mitz used the knowledge they obtained from anatomic cadaver studies to describe the Superficial MusculoAponeurotic System (SMAS). They had noticed that this layer was a continuous with the platisma of the neck, the temporoparietal fascias of the scalp, and these layers envelop the facial mimetic musculature [19].

The discovery of this fascial layer paved the way for modern facelifting techniques. There was further progress made when Furnas described the ligaments of the midface in 1989.

Knowledge of the midfacial ligaments presented an improved understanding of the support system of the facial soft tissues and the responsibility they played in the aging process [20]. There were even more modifications of the facelift ensued finishing in a focus on preserving ligament release in a sub SMAS, or deep plane dissection. Other surgeons still developed subperiosteal techniques for facial soft tissue repositioning with the principal goal of resuspending descended malar fat to the malar eminence [21-23]. In recent decades, volumizing procedures such as injectable fillers have improved the outcome of the facelifts. Likewise, an emphasis on more minimally invasive techniques has turn into a part of the facial rejuvenation assemblage. These consist of limited lifts and other non-surgical lifting procedures. Surgical and non-surgical procedures all could have a outcome not so bright, for example, infection, skin necrosis, hematomas, seromas and could even cause damage to the frontal and minor branches of the facial nerve, in addition to the dangers associated with general anesthesia or even conscious sedation [24]. In the remainder of the article, we review the different techniques used surgical and non-surgical, with a small discussion about the techniques and results. The goal is to provide a basic understanding of the different techniques used in modern medicine.

3.0 Surgical Methods

3.1 Subcutaneous Facelift Technique

Early techniques focused on small local incisions near the hairline in the natural skin creases, after with removal of skin strips and closure of the skin without undermining the deeper layers of the face. More modern techniques involve combining temporal hairline incisions with a post or pre-tragal incision that curves around the lobule postauricularly and ultimately finishes in the occipital scalp. Bettman and Bourget are credited with combining these incisions with undermining of a large random pattern skin flap [16]. Joseph was the first surgeon to pioneer the concept of the post-tragal incision to the vertical preauricular incision in 1928 [17]. So the main purpose of the subcutaneous lift is to tighten the loose facial skin and remove the excess tissue without addressing the deeper tissues. It is a relatively easy and safe procedure, which will result in improvement of the lower face and upper neck. However, this technique fails to tackle ptosis of the midface and it doesn't address the effects of aging on the deeper structures in the face. If we don't re-suspend the deeper tissues, the skin fold is normally set under strain tension which leads to loss of its effect secondary to the inborn flexibility of the skin. Consequently, the subcutaneous facelift is regularly utilized as a part of chosen circumstances where skin laxity is the principle issue.

3.2 SMAS Technique

The idea of deep tissue layer suspension denoted a real change in outlook in facelift method. Tord Skoog was an early promoter of deeper suspension rather than depending on skin tension alone to accomplish his facelift [18]. In any case, it was not until 1976 two years later that Mitz and Peyronie depicted the Superficial Musculoaponeurotic System or SMAS [19]. The fibrous tissue adhesions of the SMAS to the overlying subcutaneous fat and skin took into account surgical manipulation of the SMAS to impact changes in the skin. This anatomic idea quickly spread through the cosmetic surgery community, furthermore, SMAS lifting technique turned into the standard for quite a few years. Management of the SMAS still remains an imperative segment in order to achieve successful outcome. The fundamental techniques for tending to the SMAS include either plication or imbrication. Plication includes suture suspension alone to reverse the vectors of aging. The SMAS of the lower face is pulled vertically folding and anchoring it to the more stable and immobile SMAS overlying the parotid. The writer utilizes a variation of this technique, referred to as the "buccal cerclage", which includes a series of three particular suspension sutures to lift the neck, bring down face, and improve the jaw line. Imbrication of the SMAS comprises of an entry point inside the SMAS layer with resection of a portion of the SMAS followed by suture suspension of the incised ends to reverse vectors of aging [24-26]. Imbrication usually involves limited sub SMAS dissection to the anterior edge of the parotid. These previously mentioned methods are by and large respect safe and easy to master. SMAS plication and imbrication, at the point when done appropriately, pose little hazard to the facial nerve with great long term results. For plication, the principle concern is the capacity of the suture to keep up the lift without ¨cheddar wiring¨ through the tissue. Both SMAS imbrication and plication are less compelling in restoration of the midface and melolabial fold as they are the jaw-neck line [27] Tipton [28] in 1974 and Rees and Aston [29] in 1977 performed mixed cosmetic facelift procedures utilizing a skin only lift on one side and a SMAS adjustment on the other. Post-operative photos were taken for comparative purposes, without any distinctions noted between the sides. These studies, be that as it may, suffered from lack of standardized objective measurements to adequately break down contrasts between the different techniques.

3.3 Deep Plane Technique

The real shortcoming of the SMAS procedures is the capacity to viably rejuvenate the midface and malar fat cushion. To address this issue, Hamra depicted the "deep plane rhyitidectomy", in which he lifted the midfacial soft tissues in a plane between the shallow and deep fascia. This made a thick myocutaneous fold-out of the skin and subcutaneous fat to be suspended by superiorly [30]. The deep plane facelift was a change from standard esthetic technique, in the 1980s and early 1990s that particularly addressed to ptosis of midfacial structures and deep nasolabial folds. Hamra noted enhanced cosmetic outcomes in the midface, which has been supported by different authors as well [31]. Once the dissection reaches a point in front of the line reached out from the horizontal canthus to the edge of the mandible, dissection changes to the sub-SMAS plane. Sub-SMAS dissection is conveyed medially over the zygomaticus major and minor to a point on the side toward the melolabial crease. The SMAS layer is liberated from the ligamentous connections in the midface, and vertically resuspended to revive the face [30]. This method apparently enhances the nasolabial crease, neck and midface to a more prominent degree than conceivable with conventional SMAS procedures. Proponents likewise guarantee longer enduring change, a more natural appearance, and diminished frequency of hematoma and flap compromise. The disadvantages include more prominent tissue injury, longer recovery period, more specialized dismemberment with expanded hazard to the facial nerve, and longer surgical time. A few studies have compared the deep plane technique with more customary SMAS techniques. Adamson et al [32] agreed with Hamra's claim that the deep plane rhytidectomy enhances rejuvenation of the midface and neck contrasted with SMAS plication. Ivy et al, [33] in any case, discovered no noticeable improvements in a side to side examination in patients with SMAS lifts versus composite rhytidectomies. Despite a lot of reversal of midfacial ptosis was noted intra-operatively utilizing a more extensive technique, the improvements were not as notable as wanted at later checkups. Likewise, Becker and Bassichis also were looking for future perfect patients for the deep plane technique. Their results demonstrated that patients between 50-69 years had a pattern toward acquiring better outcomes from the SMAS plication cosmetic face-lift, and patients between 70-80 years had a pattern toward getting better outcomes with the deep plane cosmetic facelift. They concluded that the deep plane cosmetic face-lift did not offer better outcomes over the SMAS plication facelift in patients younger than 70 years [34].

3.4 Minimally Invasive & Non-Invasive Techniques

Not long after the promotion of deep plane of wrinkles removal methods in the late 80s and mid 90s, there was an anticipated counter-development towards all the more minimally invasive procedures. Even though the deep plane surgical procedure required more surgical time, longer improvement time, and increased risks, the advancement and development of minimally invasive medical procedure offered the direct inverse. These procedures could be performed under local anesthesia in a daily clinic. One such technique that picked up prevalence at the time was the threadlift. Sulamanidze first introduced this technique, in the late 1990s. This procedure included subcutaneous position of barbed strings, which were pulled to give the lift and trimmed at the entry point [35]. The promoted advantage was that it was a "non-surgical" technique with short recovery time and quick results. However, a few studies have brought into question the pinnacle impact and life span of the method. Lycka et al [36] came up with one-third of patients that maintained up to 70% of the original effect 1-2 years after the surgical procedure. A controlled case arrangement by Abraham et al [35] demonstrated insignificant change on blinded evaluation when contrasted with a control group who had other rejuvenation methods done. In 1999, Saylan illustrated a short-scar technique he named the "S-Lift" which included a S-formed skin cut intersection the non-hair-bearing skin at the helical root, pre-extraction of skin, and vertical purse-string sutures in the SMAS. The sutures were secured to the periosteum of the zygomatic arch to accomplish the lift [37]. Tonnard and Verpaele later adjusted this approach by changing the cut to take after the outskirt of the sideburn (hairline), cut out the skin extraction after the lift, and most outstandingly to attach the purse-string plication sutures to the temporal fascia rather than the zygomatic arch. They named this lift the Minimal Access Cranial Suspension Lift (MACS lift). The impact of the purse-string was thought to make "microimbrications" inside the SMAS [38]. After some time surgeons noted that, MACS lift had comparable results to traditional SMAS techniques. On the other hand, most minimally invasive techniques are subject to criticism regarding long-lasting results. In recent years, even less invasive, some non-surgical techniques have been developed which present skin-tightening effects. These include laser, ultrasound wave, and radiofrequency. All the non-invasive techniques are aimed to target collagenous tissue such as the reticular and papillary dermis to apply their effects. Although the results of these non-surgical options may not be as dramatic as some of the surgical lifts, they do offer a good alternative to those unable to afford or unwilling to undergo surgery.

4.0 Non-surgical methods

4.1 Volumetric techniques

Facial maturing is a dynamic and liquid process that includes delicate tissue plummet, as well as collapse and loss of facial volume. After some time the face loses both fat and volume and the skin loses collagen and elasticity [39]. As we age our full cheeks and heart-shaped facial appearance of youth, gives way to aged hollowed face with less subcutaneous fat-pads and really thin skin. The authors that have been mentioned before depicted facelift techniques, focused around correcting facial plummet problems and didn't really address mid facial collapse. It is acknowledged today that, paying little mind to the method used, any facelift technique ought to consider the fact that the deeper tissues must be filled or repositioned before the skin is pulled over and resected [40]. In recent years, through collaborations, for example, those by Lambros, a better comprehension of facial aging has created bringing about the incorporation of volumization into the treatment algorithm of current facelift surgeons [41]. Strikingly, the original idea of fillers for soft tissue augmentation has been around since the late 1800s. In 1893, Neuber portrayed filling a depressed facial scar with fat transfer [42]. Paraffin, a purified blend of strong hydrocarbons from petroleum, was likewise utilized as tissue space filler. Most of the major surgeons, for example, Billroth, Gersuny, and Delangre were noted to utilize paraffin infusions to treat different problems. Kolle distributed a paper in 1911 portraying the remedy of a saddle nose by paraffin infusion. He additionally noticed the number of difficulties, including serious granulomas, emboli, visual impairment, and even death [43]. Because of this paraffin as a filler fell out off the market by the late 1920's. Silicone is yet another type of filler that has been utilized as a tissue filler for a while, however has to a greater extent dropped out of the market, because of its side effects and the technique sensitive application. In spite of the fact that few filler materials have fallen off the market, there are numerous choices accessible for facial rejuvenation. These consist of collagen, calcium hydroxyapatite, poly-L-lactic acid, and Hyaluronic Acid (HA) products. Of these products, HA fillers are among the most broadly utilized secondary to their life span, viability, safety, application, and in particular, reversibility. Infusion of hyaluronidase can be utilized if necessary to breakdown the injected hyaluronic acid [44]. This is especially vital in the uncommon instance of intra-vessel penetration as the results can be pulverizing. The Food and Drugs Association (FDA) has approved most of the commercially available fillers that are in nature. These substances eventually resorb, requiring repeated injection for up keeping of the aesthetic outcome. Consequently, autologous fat transfer is a popular and prevalent option. This "permanent" alternative is safe and effortlessly performed with facelift surgery as secondary volumization of the midface.

One must remember that fat injections can experience the ill effects just like the other types of fillers we have mentioned before. There is another type of midface volumization which addresses the malar area, it's the malar implant. Malar implants can fill in the space that has been lost due to aging, like the infraorbital rim and buccal hollow spaces. However, they can't present the plasticity and natural appearance of soft-tissue fillers [45]. The blend of facelift surgery with volumization, especially in the midface, completely addresses the impacts of aging. Not exclusively is suspension of soft tissue crucial to facial rejuvenation, but substitution of atrophic tissue is important as well. At the point when utilized as a part of conjunction with face-lift procedures, volumization can bring about sensational changes in appearance.

4.2 Hyaluronic Acid Fillers

Despite the fact that Hyaluronic Acid (HA) fillers may appear to be similar, they in reality each have distinctive physical properties that separate them, settling on appropriate product decision is imperative when utilized for facial rejuvenation. Factors, for example, HA concentration, number of cross-linking, extrusion forces, particle size, and elastic modulus (G´) impact product selection and indication. That's why there is no universal HA filler. HA is found everywhere in the human tissue yet the injectable products are acquired from animal or bacterial sources. The HA molecule is a glycosaminoglycan disaccharide made up of alternately repeating units of D-glucuronic acid and N-acetyl-D-glucosamine. At a physiologic pH, HA ties water extensively, giving "fullness" to the tissue. HA might be tailored by chemical cross-linking between HA strands, which adds to the product firmness, making it more resistant to pressure and stress, and furthermore making it more impervious to in vivo enzymatic degradation, resulting in a longer duration of filler impact. A product's G´ might be utilized to portray its firmness or capacity to "lift" tissue. A high G´ product will require more pressure applied to distort it, while a low G´ product will misshape with minimal applied pressure. In clinical terms, low G´ HA products might be better for barely recognizable lines, wrinkles and where firmness isn't wanted, for instance in the lips. High G´ products might be more qualified for deeper tissue elevation, for example, moderate to extreme nasolabial folds and malar enhancement. At last, on the grounds that HA bind free water really well, it may bring about tissue swelling after injection. This is in part reliant on HA molecular alterations and the amount of cross-linking. Every patient will have unique objectives and desires as well as individually hidden anatomic inconstancy and phases of aging that should be considered when arranging treatment. A full facial investigation by the doctor, joined with patients understanding and agreement with the treatment design, will accomplish a positive result. As a rule, a neuromodulator might be utilized to prevent lines and wrinkles that form with movement (active lines) and HAs can be utilized for lines that are present at rest (static lines) [46].

We can use HA products to improve the wrinkles of the following facial regions, forehead lines, temples, superior orbital rim, glabella, upper eyelid, malar, submalar and cheek hollowness, nose, lips, per oral, lip lines, nasolabial folds, marionette lines, jaw line, chin, and earlobes etc. Mild swelling and ecchymosis can be expected once in a while, insistent swelling may occur, particularly in the lower orbital region. Palpable knots, granulomas, lumps, and nodules are not common when legitimate injection method is used. More destructive difficulties usually include an intravascular injection, which can cause huge tissue necrosis and visual impairment [47]. When an intravascular injection is detected, a preplanned protocol ought to be activated [48]. HA fillers have extended treatment option for facial aging and are regularly joined with other nonsurgical procedures, for example, neuromodulators and skin treatments. They are acknowledged by the public in general and should be offered by every esthetic surgeon who performs facial rejuvenation procedures.

4.3 Fat Grafting Techniques

Historically, the utilization of fat grafting to rectify inherent deformations and complex horrible traumatic injuries with soft tissue loss after radical oncological surgical procedure was proposed in the late 19th century. In 1987, Coleman acquainted another method with diminish traumatic management of fat during liposuction. His technique comprised of three stages: manual lipoaspiration with low pressure, centrifugation for 3 minutes at 3400 rpm, and reinjection in 3D. This method remains the gold standard for liposuction and lipofilling, yet it has experienced some specialized changes [49,50]. In 2009, fat grafting represented up to 6% of all non-surgical aesthetic procedures [51]. Nonetheless, as we know the results of lipofilling can be different, not evenly distributed everywhere, improvements of the techniques are required. The long term results of fat grafting are frequently frustrating results because of unpredictable fractional absorption of up to 70% of the volume of the fat graft. Various examinations have detailed resorption rates of 30% to 70% inside a year [52]. On the other hand, one of the issues seen is a decline in the quantity of fat cells as a result of harm caused during the aspiration and centrifugation steps [53]. Another problem to tangle is the requirement for the fat cells to be in close contact with well-vascularized tissues [53]. Various adjustments of the Coleman have been endeavored so as to enhance the survival of the infused fat cells, including atraumatic fat-harvesting, fat washing to wipe out inflammatory mediators, centrifugation, and incubation of fat grafts with various bioactive agents. Fat is a filler with perfect properties: it naturally joins together with your own tissues, it's autologous, and is 100% biocompatible. Autologous fat grafting has an essential part in facial restoration. Truth be told, the one of a kind regenerative capability of lipofilling gives way to magnificent outcomes because of its filling properties and the amount of Adipose-derived Stem Cells (ASCs) that it composes.

Thus, lipofilling has special features, and plastic surgeons can utilize it to rectify delicate soft-tissue insufficiencies as well as to revive the skin of the face [54]. Customary fat grafting includes Coleman's harvesting technique with 2-mm side-port cannulas, trailed by the allocation of structural fat embed all through the different dermal layers of the face, from profound to shallow [55]. Inconveniences of customary fat grafting include the dangers of unpredictable fat aggregation, fat necrosis, and noticeable unevenness. Since the eyelid skin is generally thin, the periocular region is most susceptible to outline predicament, and in this manner, profound implantation of fat is prescribed [56]. More recently, for example, those pointed out above, numerous authors have as of late focused around microfat grafting methods [55,57]. A noteworthy impact of micro-fat injection is the change for better in the viability of adipocytes through the disruption of fat lobules [56], which is in opposition to Coleman's theory that conservation of the lobular structure is fundamental for fat survival [49]. Besides, Moscatello et al. [57] exhibited that the more prominent surface area of the disturbed fat lobules on the beneficiary bed essentially enhanced fat survival after injection. In recent times, different authors have proposed "ultra-micro" fat as an extremely shallow implant in the periocular and perioral region [58,59]. These more up to date methods depend on fat harvesting with Coleman's customary cannulas, trailed by different modalities of fat preparing and processing to disrupt the bigger fat lobules that had been gathered [57-60]. Tonnard et al. [56] revealed that manual fat emulsification gives a nanofat arrangement rich in the Stromal Vascular Fraction (SVF) and therefore ASCs, however without suitable adipocytes. Therefore, the indication of nanofat are allegedly limited to skin rejuvenation, but do not add volume restoration [58,61].The real impact of nanofat injection is most likely an stem cell activity, so nanofat injection could rather be considered as an in vivo tissue-engineering procedure [58]. It may be coherent to dispose of the dead adipocyte portion from the nanofat and to infuse the filtered stromal vascular part only. Also it is known that apoptotic cells secrete cytokines and pull in macrophages that provoke growth factors which assume an imperative role in recovery of the damaged tissues [58]. Therefore, co-injection of fragmented adipocytes may be stimulating and triggering the stem cells to differentiate and help the tissues to regenerate once again [58]. Cosmetically, the primary surgical indications of lipofilling for facial rejuvenation are the improvement of dark circles [62], in addition to blepharoplasty, or as a different treatment for hollow eyes and malar bags [58,63]. Fat injections aren’t supposed to be injected between the skin and muscle, because the skin here is very thin and prone to leave palpable and visible irregularities [56,63]. Patients who choose to have augmentation rhinoplasty are frequently worried of a short nose and a low dorsum [64]. Both synthetic implants and autologous grafts can bring about adequate results of rhinoplasty. When all is said and done, synthetic implants are related with higher rates of complications, for example, dislodging and/or expulsion from its original place.

Coleman [49,65] stressed that structural fat grafting to areas with thin skin, for example, the periorbital region, must include the smallest fat lumps. The nasal dorsum has the characteristics of really thin skin and restricted space, so the implantation of large fat parcels will probably yield dislodgement of the implant, nodulation, and skin inconsistencies [64]. That's why most often, autologous microfat transplantation is the best way to go about to get a perfect profile of the nose [64]. On account of these properties and in light of the fact that these fat cells can be effortlessly gathered in great sums with neglectable morbidity to the donor-site, ASCs have ended up being especially promising for regenerative treatments [66,67].

5.0 Complications

5.1 *Hematoma*

Hematoma is the most widely recognized early complication following cosmetic face-lift surgical procedure. Resorption of adrenalin early in the postoperative time can lead to rebound hypertension and resulting in hematoma [68]. The incidence in non-hypertensive patients is around 3%, however the occurrence rises roughly to 8% in hypertensive patients and in male patients [69]. The most well-known reason for hematoma is identified with uncontrolled blood pressure. Patients who preoperatively have a history marked by hypertension should be told to take their blood pressure drugs on the morning of surgical procedure is scheduled. At the same time, oral clonidine (0.1 to 0.3 mg) or a transdermal patch (0.1 to 0.2 mg) can be put on the patient preoperatively or intraoperatively, in that order, to keep blood pressure low in the perioperative period, particularly as the injected adrenalin is being absorbed. Intraoperative hypertension must be very well controlled, and maintained postoperative beneath systolic blood pressure of 140 mmHg is desirable [70]. Injected adrenalin from the local anesthetic solution is gradually absorbed, in a way so that postoperative hematomas more often than not happen 4 to 10 hours after surgical procedure. Concomitantly, pain, anxiety, restlessness, and/or nausea must be well controlled, as each factor may build up the blood pressures and cause hematoma [71]. The incidence of hematoma is accelerated in patients that are on medications such as aspirin and other Non-Steroidal Anti-Inflammatory Drugs (NSAIDs). Also other agents like ginger, garlic, fish oil, vitamin E, green tea, and glucosamine etc. [70]. All should be stopped 2 to 3 weeks before any elective surgical procedure [71,72]. The earlier you intervene and eliminate edema and tissue ischemia the better your results will be, and you will eliminate skin flap necrosis [70,71].

5.2 *Skin Necrosis*

The frequency of skin necrosis following a rhytidectomy is in the range from 1% in sub-SMAS techniques to 3.6% in subcutaneous face lifts [68]. The rate of skin flap ischemia is fundamentally higher with excessively thin flap dismemberments, extreme tension, hematoma, constrictive dressings, and vascular obstructive disorders, especially in smokers [68,73]. Skin necrosis is supposed to be tended to conservatively with local wound care; the greater part of cases will in the end mend spontaneously. Adjustments in the postoperative regimen can limit flap edema and subsequently lead to ischemia. Furthermore, avoiding of neck dressings will stop pressure necrosis from forming on the thin neck flaps and permit suitable venous return. Moreover, limitation of salt and water intake may restrict postoperative edema, which influences tissue ischemia as well as stress relaxation of the skin flaps [74].

5.3 *Infection*

The rate of wound infections is extremely uncommon after rhytidectomy. Intravenous perioperative antibiotics for *Staphylococcus aureus* or *Staphylococcus epidermidis* prophylaxis (commonly a cephalosporin or vancomycin) are routinely preferred, despite the fact that there is little confirmation to support their administration. Preauricular infections may come about because of *Pseudomonas aeruginosa* colonizing the otic canal [75]. *Pseudomonas* infection as a rule react to oral ciprofloxacin however may require drainage via incision. In those in risk (health care experts) or known carriers for methicillin-resistant *S. aureus*, ear and nasal channel cultures can be swabbed for screening [76]. If the event presents its self, patients can treat mucosal colonization and skin flora with chlorhexidine body wash for 5 days and/or topical mupirocin ointment for 7 to 10 days preoperatively [77]. Postoperative methicillin-resistant *S. aureus* infections are dealt with oral trimethoprim/sulfamethoxazole or intravenous vancomycin.

5.4 *Nerve Injury*

Truly, the rate of a perpetual facial nerve motor branch damage following a subcutaneous or sub-SMAS cosmetic face-lift is under 1% [68]. Transient nerve malfunction in the initial couple of hours postoperatively is extremely normal and owing to the lingering impacts of local anesthetic [78]. Delayed nerve malfunction recognized days after the fact might be attribute to cautery, traction, surgical division and sutures [71]. Unplanned recovery is normally noted inside 3 to 4 months. The most ordinarily injury to the motor branches are likely to be buccal; on the other hand, they frequently go unnoticed or are all the more sympathetic due to the rich collateralization of the branches [71,78,79].

The marginal mandibular branch and the frontal branch are less tolerant to damage due to their insignificant arborization and are destined to bring about clinically critical sequelae after injury [79,80]. Sensory innervation of the skin flap is constantly disrupted after rhytidectomy; nonetheless, patients normally recoup spontaneously, for the most part within a year. The most commonly harmed sensory nerve is the greater auricular nerve. Perceived damage ought to be repaired instantly intraoperatively. A painful neuroma may appear after damage as well as repair, however this event is luckily rare [71].

5.5 *Unsatisfactory Scars*

Improper cuts can prompt evident scars, twisting of the ear, and unnatural irregularities of the hairline. Unreasonable tension can lead to loss of hair, depigmentation, and broadened scars [71,78]. Cuts inside the hairline ought to be slanted to protect the hair follicles with the goal to have the hair grow through the entry point so that masking of the scar can be accomplished [74]. Early in the postoperative period, antibiotic creams applied day by day will epithelialize wounds quicker and enhance scar results. Broadened or irregular scars can be enhanced with scar modification, which ought to be delayed to no less than a half year postoperatively, when tissues have loosened up more. Hypertrophic scars can be cared for with intralesional steroid injections at month to month intervals [74].

6.0 Smoking leads to Complications

The incidence of cosmetic face-lift skin flap necrosis is 12.5 times more prominent in smokers than in nonsmokers [81]. Smoking intensely induces transitory vasospasm [82] and chronically encourages obliterative endarteritis [85]. Therefore, smoking generates an environment of relative tissue hypoxia and delayed wound healing due to vasoconstriction, irregular cell function, and is prone to thrombogenesis [86]. Patients should stay away from smoking a month prior to medical procedure and a month after medical procedure. Since sudden cessation of nicotine products is very often unsuccessful due to their addictive nature. A more step by step transition with nicotine patch or gum, complement with psychotherapeutic medications, should prove to be more effective in smoking cessation [70]. Just pointing out, patients commonly underreport their smoking propensities. Given the potential ischemic problems of smoking, surgeons might be encouraged to screen suspicious patients. Cotinine, the metabolic derivative of nicotine, can be distinguished for up to 4 days after smoking [85]. A salivary or urinary cotinine test is available for medical workers and is uniformly efficacious [86,87].

7.0 Conclusion

We as the human species try to hold on to eternal youth for as long as we can. As demonstrated in this paper, all different techniques (surgical or non-surgical) have their own challenges and complications. The end results should be for the patients a great cosmetic outcome. Each surgical or non-surgical method used today needs to be tailored individually to suite each patient. Every one of the patient's facial anatomy, age, gender, diet, life style, ethnicity, and genetics are different, so it is difficult to make a general assessment for all. But if the means for finances are available, then surgical approaches seem to yield longer and more permanent result if used in parallel with some type of non-surgical method. It is evident that surgical approach is superior in certain cases to the non-surgical methods in facial rejuvenation, as seen with Becker and Bassichis studies. "Surgical approaches for patients between 50-69 years had a pattern toward acquiring better outcomes from the SMAS plication cosmetic face-lift, and patients between 70-80 years had a pattern toward getting better outcomes with the deep plane cosmetic facelift" [34].

Also looking into a non-surgical technique with HA fillers, they have become almost a norm in today´s society. They are used throughout the face with great results and only few minor complications that ensue if injected inside a blood vessel. Other complications include lumps, nodules, and granulomas can develop [47].

When looking at fat-grafting one can see the benefits of side by side work, surgical and non-surgical methods, put into one, to yield the greatest results in aesthetic surgery today. Fat-grafting has another great function in reviving the face. Since fat consists of ASCs, we know that after injection there is great possibility of regeneration of atrophic tissues. There is a small down fall in fat-grafting, which can be the relatively short duration of implant owing to unpredictable absorption of fat [50]. The few other inconveniences are the unpredictable fat aggregation, fat necrosis, and sometimes noticeable uneven plantation of the graft, which could be corrected. Although the results of these non-surgical options may not be as dramatic as some of the surgical lifts, the non-surgical methods do offer a good alternative to those unable to afford or unwilling to undergo surgery. Since we know for the best results we have to combine most often a surgical procedure with some type of filler, lifting of the mid-face posterosuperiorly and filling the facial hollowness owed to loss of tissue.

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Biography

The author was born in Teheran Iran in the year of 1983. Within his first year of life the whole family moved to Sweden where they resided for over a decade. His family didn't settle there, in the late 90's they moved and lived in southern California for another decade. There he started to show interest in science during high school. Eventually Shahab moved back to Sweden where he went back to school and made the decision to enter a medical University. Finally he ended up in Zagreb, Croatia to start his future carrier in medicine. He still lives in Zagreb, Croatia with his life partner, where he is going to stay until receiving his medical license.

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