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EMPLOYING ALGORITHMS IN COSMETIC FACIAL SURGERY

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ВНЕДРЕНИЕ АЛГОРИТМОВ В ОПЕРАЦИИ ПО КОРРЕКЦИИ ВНЕШНОСТИ ЛИЦА

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Abstract. The aim is to evaluate the scientific literature on the creation and application of algorithms in clinical settings, with a focus on their efficacy. Material and methods. The literature search was performed using the databases Scopus, Medline (PubMed), eLibrary (in total: 32 scientific papers). Results. The acquisition of data pertaining to the principles of algorithm development was accomplished, and the notion that algorithms will increasingly be adopted across a range of plastic surgery specialties was validated. Conclusions. Based on scientific research data, it can be inferred that the development and implementation of algorithms play a significant role in an aesthetic surgeon's work in surgical practice. All authors unanimously support the effectiveness of integrating algorithms into clinical practice, some of which were developed by them for the first time. When planning and executing surgical procedures, it is emphasized to base on individual patient data, as well as the relevance of such developments in improving the achievement of better surgical correction outcomes. In some instances, the implementation of algorithms in clinical practice has led to a significant improvement in patients' quality of life after the interventions. Each correction method has its unique effectiveness. The positive results of the work on the development and implementation of algorithms in clinical practice suggest that the development of this type for aesthetic interventions on the lower third of the face would allow for: 1) improved aesthetic outcomes, 2) enhanced intervention quality, 3) a reduction in the number of interventions necessary to achieve a positive and long-lasting effect, 4) a decrease in the likelihood of short-term and long-term postoperative complications, and 5) lower treatment costs and shorter treatment duration.

Аннотация. На современном этапе развития пластической хирургии имеются существенные различия в подходе к планированию и проведению операций, связанные с принятыми в хирургических школах правилами и индивидуальным опытом хирургов. Все больше предлагаются различные «авторские» методы проведения хирургических вмешательств, основанные как на классических, так и на современных технологиях. Одновременно наблюдается рост требований к качеству оказания квалифицированной медицинской помощи. В связи с этим в научной литературе поднимаются вопросы о разработке эффективных и одновременно безопасных алгоритмов работы, подкрепленных объективными данными. Высказывается мнение, что внедрение и использование алгоритмов работы может быть полезным для улучшения качества хирургического вмешательства, повышения эстетического результата и удовлетворенности пациентов. Цель исследования. Анализ научных публикаций, сообщающих о разработке и внедрении в клиническую практику эстетической хирургии лица алгоритмов работы и об их эффективности. Материал и методы. Поиск литературы выполнен в базах данных Scopus, Medline (PubMed), eLibrary. Проведен анализ релевантных источников. Использованы 32 научные работы. Результаты. Получены данные о принципах разработки алгоритмов, подтверждено предположение о тенденции к внедрению алгоритмов работы в различных областях пластической хирургии. Выводы. При работе с верхней и средней третями лица в научной литературе подчеркивается клиническая польза и актуальность внедрения алгоритмов. Случаев разработки и внедрения в практику алгоритмов при работе с нижней третью лица в научной литературе до настоящего времени не отмечено.

Keywords: plastic surgery, algorithms, aesthetic surgery, facial rejuvenating surgery.

Ключевые слова: пластическая хирургия, алгоритмы, эстетическая хирургия, омолаживающая хирургия лица.

In recent years, there has been a great deal of progress in the field of plastic surgery, thanks to advancements in medical technology. Nevertheless, there are still significant variations in the methods used by surgeons, which are often influenced by the rules and practices of surgical schools. Some surgeons choose to follow traditional methods, while others use modern techniques to perform operations. As a result, there is an increasing demand for high-quality medical care, and scientific literature is now calling for the development of work algorithms that are both effective and safe. These algorithms could be useful in improving the aesthetic results and overall patient satisfaction of plastic surgery procedures. The face is a region that has garnered significant interest from plastic surgeons due to the noticeable progression of age-related alterations in this area. According to a study that examined long-term postoperative follow-up, self-assessment data, quality of life, and skin system condition using histologic and instrumental examination methods in individuals of varying ages, N. E. Manturova (2012) analyzed the duration of the effects of different surgical techniques used to correct the involutinal changes in the skin system and created a diagnostic and therapeutic algorithm to manage patients with facial skin system involutinal changes. This algorithm considers various patient factors and is presented in Figure 1 [1].

To address both inherent involutinal changes and aesthetic defects associated with aging, a multidisciplinary approach is proposed, combining conservative methods with radical, surgical techniques. Research has successfully achieved the development and clinical testing of individualized algorithms for treating age-related skin disorders through surgical means. These

algorithms are based on preoperative diagnostic assessments, which take into account clinical, laboratory, and morphological changes in the skin system [1-5].

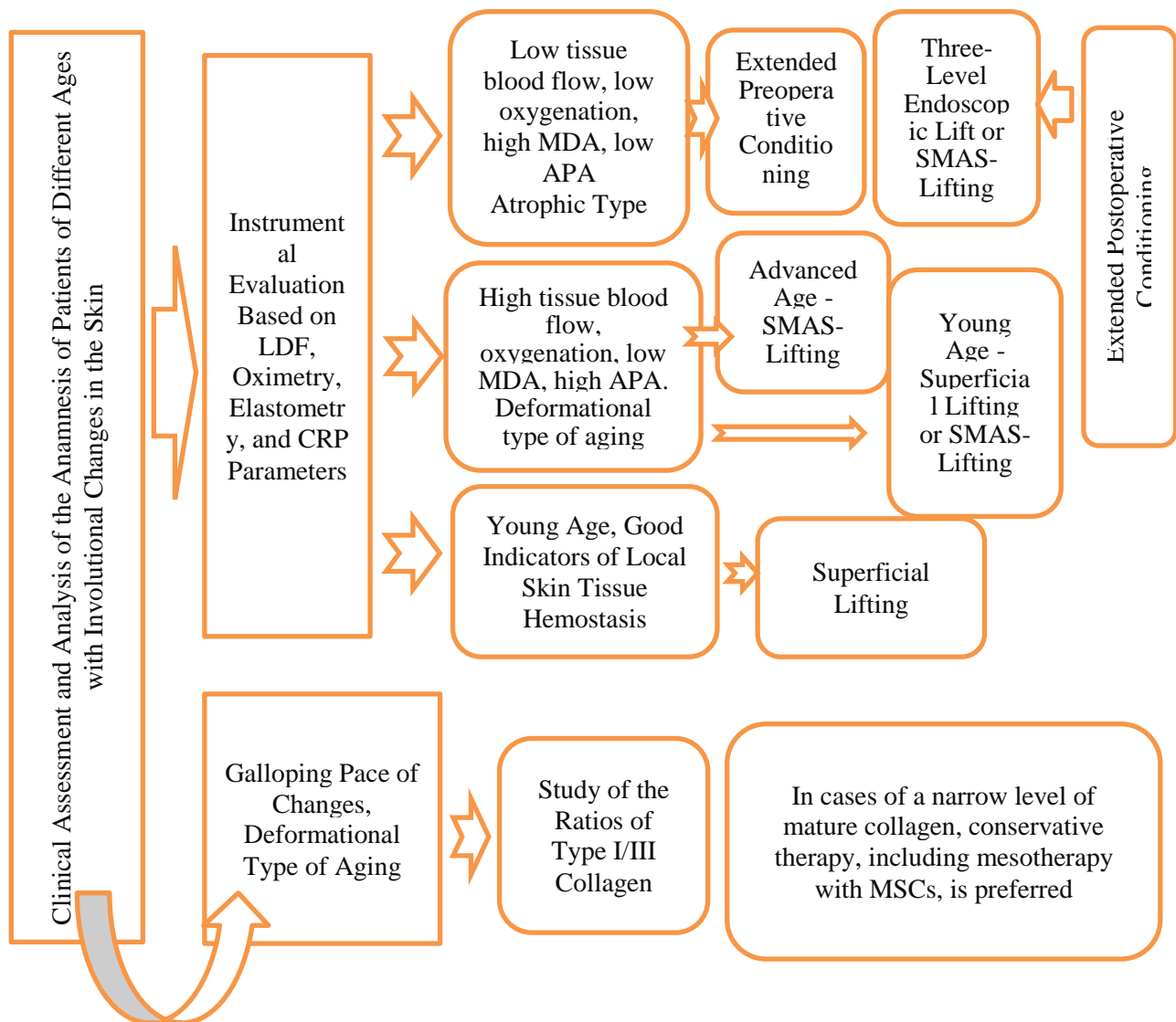


Figure 1. Diagnostic and Therapeutic Algorithm for Managing Patients with Involutional Changes in the Facial Skin System

Algorithms in aesthetic surgery of the upper third of the face

Correction of age-related changes in the upper third of the face, including ptosis of the eyebrows, is typically performed through surgical interventions. Patients often present a complex of complaints such as horizontal and vertical wrinkles, ptosis of the brow head, body, or their combination. There are various surgical techniques available to address these changes, including direct lifting of the eyebrows, midline lifting of the eyebrows, pretrichial lifting of the eyebrows, temporal lifting of the eyebrows, coronial lifting of the eyebrows, endoscopic lifting of the eyebrows, and transblepharo-plasty [6, 7]. In the past, authors recommended individualizing the approach and considering the patient's complaints. As technology has advanced, some surgical techniques have been modified to improve the outcomes of the intervention [15-19].

Dr. F. Nahai discusses his expertise in conducting operative procedures on the upper third of the face, as demonstrated in his work from 2011 [20]. He has created a well-defined strategy for determining the criteria for performing aesthetic procedures on the upper and lower eyelids, which

involves evaluating both subjective and objective patient data. Objective data used in this strategy include (1) aesthetic factors: assessing skin condition, the presence or absence of excess skin, type of aging, muscle activity, and morphology, evaluating fatty deposits, and (2) safety factors: the presence or absence of upper eyelid ptosis, muscle tone, eyelid depth, and the canting position of the eye. Dr. Nahai proposes an algorithm for selecting an intervention strategy based on these data (Figure 2).

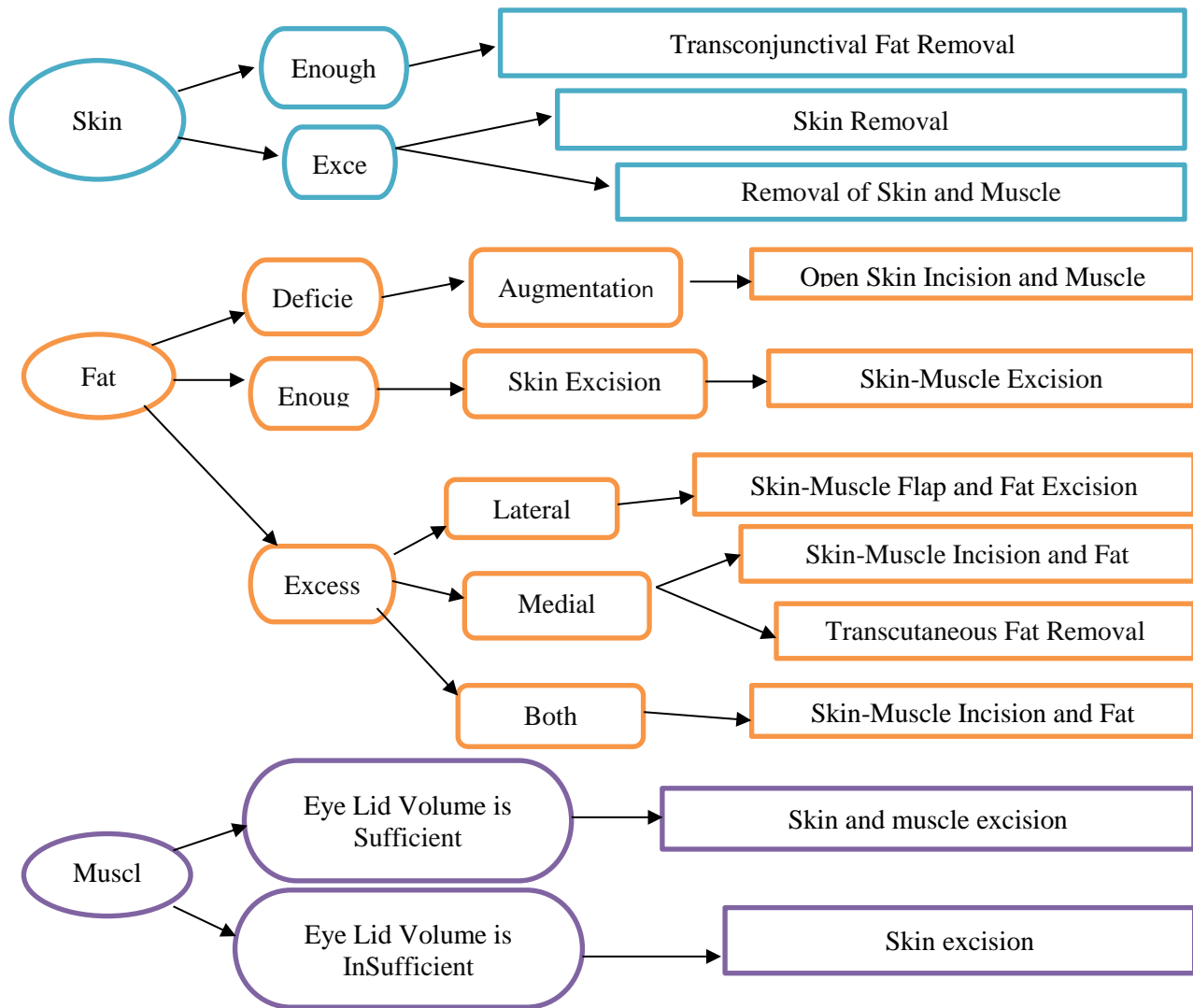


Figure 2. Options for Upper Eyelid Blepharoplasty

L. Piovano and M. D'Ettoire conducted a meta-analysis of scientific publications on the topic of forehead and eyebrow rejuvenation in 2017 [21]. In addition, they analyzed 123 cases of forehead and eyebrow lifting. Using this data, they developed an algorithm that is particularly useful for young aesthetic surgeons, as demonstrated in Figure 3.

Rohrich and M.-J. Cho retrospectively analyzed data from 159 patients who underwent surgical intervention for eyebrow rejuvenation between 2008 and 2018.. Demographic information, details about surgical procedures, complications, and outcomes were all analyzed in the study. Additionally, the authors presented a work algorithm [22] (Figure 4) in the paper.

J. E. Zins and A. Meyers (2022) shared their experience with surgical correction of the upper third of the face [23]. The study discussed the intricacies of surgical interventions, such as open lifting of the forehead and eyebrows, endoscopic lifting of the forehead and eyebrows, endoscopic

supraorbital lifting of the eyebrows, direct lifting of the eyebrows, and sliding lifting of the eyebrows.

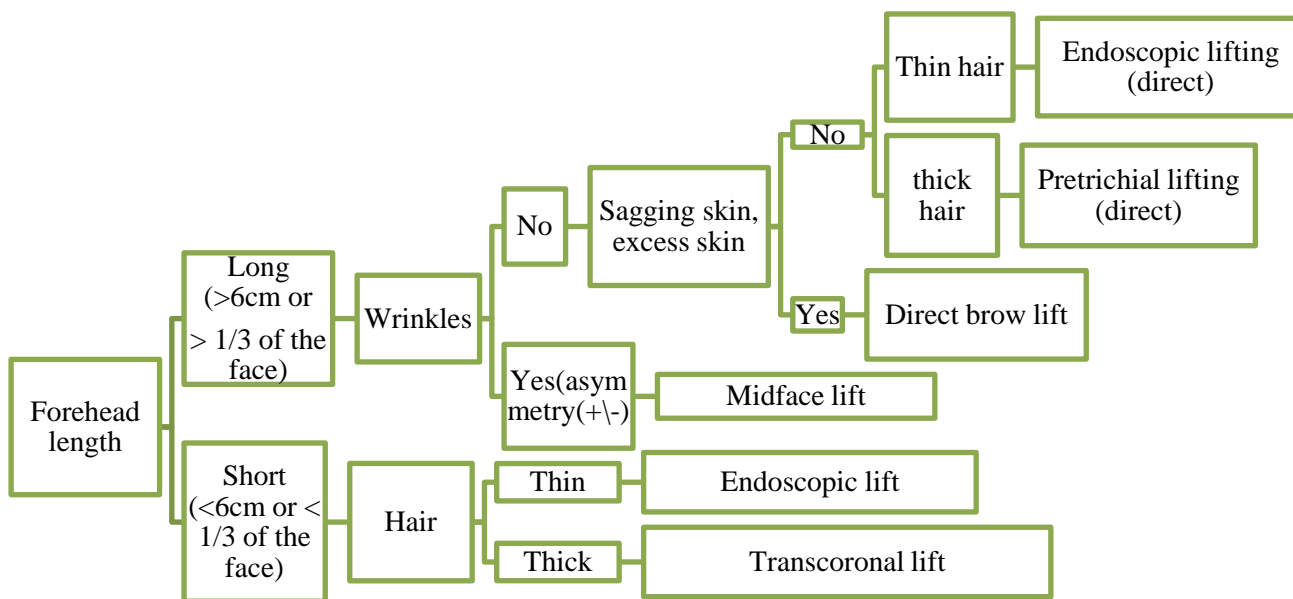


Figure 3. Surgical treatment algorithm for brow ptosis

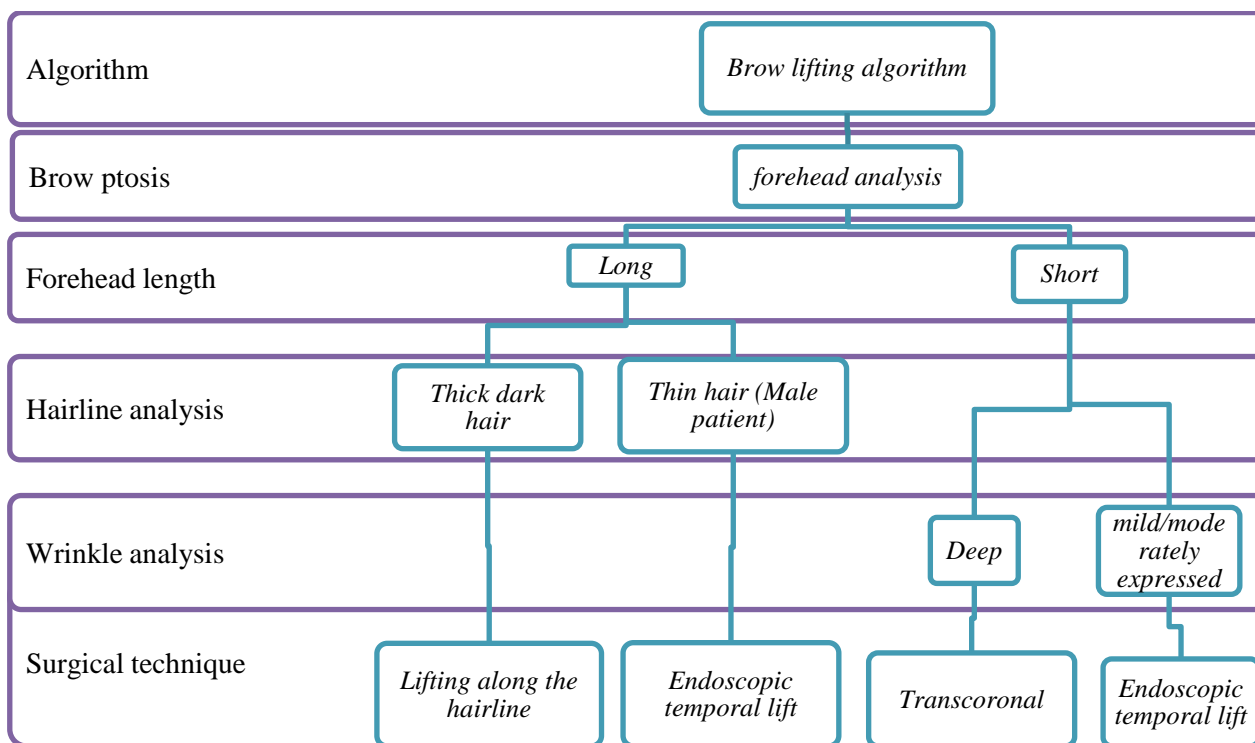


Figure 4. Brow lifting algorithm

Based on clinical experience and patient satisfaction evaluation, the authors developed an algorithm that takes into account the overall characteristics of soft tissues. The algorithm was then tested in practice, and it yielded positive results. Both subjectively and objectively, there was an improvement in the aesthetic outcome and an increase in the quality of life. The authors conclude that the surgical approach to the upper third of the face has undergone significant changes over the past 20 years due to the growing popularity of these operations. Currently, patients demand better

surgical outcomes, and it is emphasized that each patient should receive an individual approach, taking into account the uniqueness of their soft tissue characteristics.

Algorithms in aesthetic surgery of the middle third of the face

M. Pascali and colleagues (2015) conducted a retrospective study including 350 patients who underwent surgery on the middle third of their face [24, 25]. They described their own surgical experience in this area and developed criteria for preoperative evaluation based on objective data to guide further tactics. However, the authors did not provide a comprehensive algorithm for the procedure. If the zygomatic zone required additional volume, an elevator that attached to the temporal region was applied. For correcting the nasolacrimal sulcus, a midface elevator with periorbital percutaneous fixation was used.

A. A. Jacono and J. J. Rousso presented a classification system for the aging of the middle third of the face in 2015 [26]. This system emphasizes that aging is influenced by several factors that call for a comprehensive approach to rejuvenation, especially for individuals with more noticeable signs of aging, low tissue elasticity, or a weak skeletal structure in the middle third of the face. The authors proposed an algorithm based on this classification system (Figure 5).

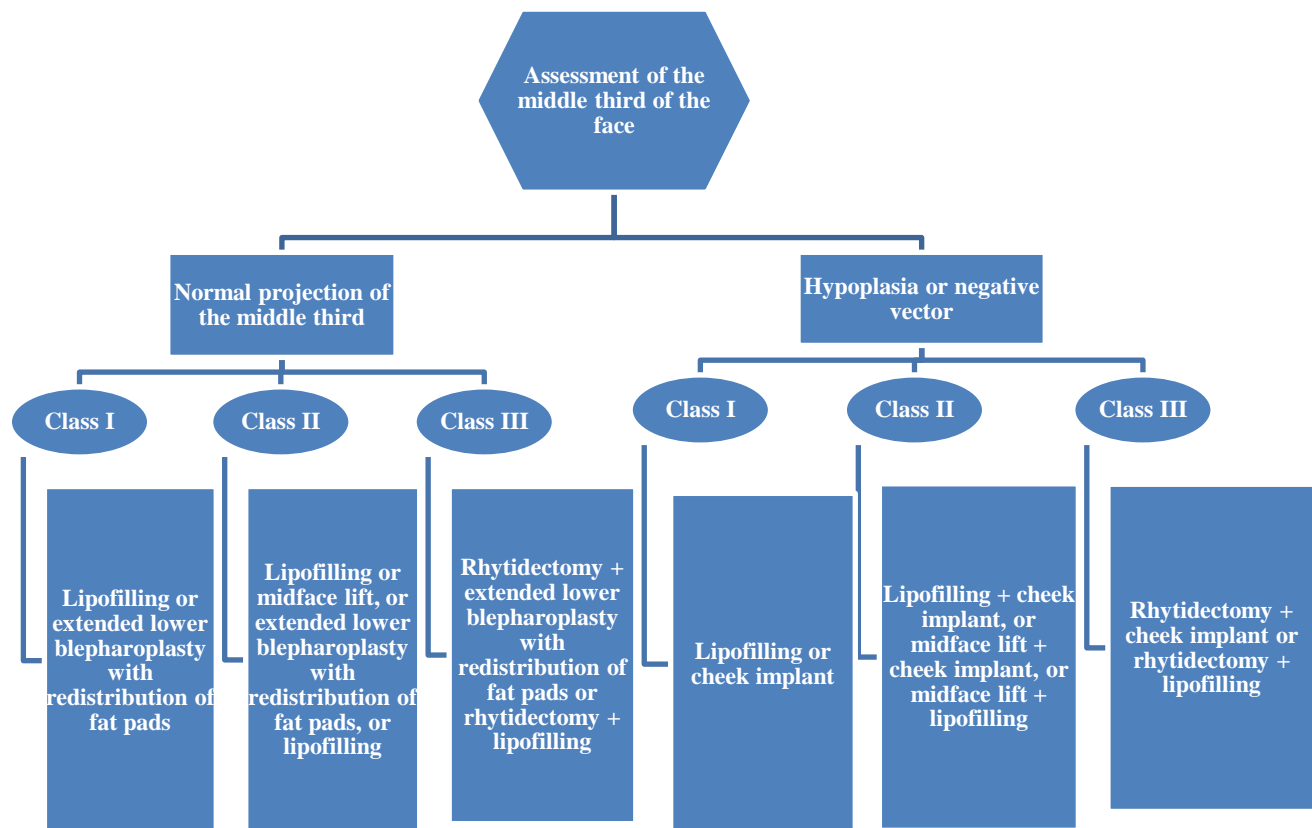


Figure 5. Midface rejuvenation algorithm

D. D. Lee et al. (2021) reported on their personal experience with surgical procedures involving the middle third of the face [27]. This research reinforces the fact that the face is a region of great interest and risk, requiring surgeons to exercise extreme caution and prudence when working in this area. The main goal of operating in this region is to combat the age-related changes in soft tissues and bones. Based on more than 20 years of experience, the authors have developed a practical step-by-step guide. This guide emphasizes the importance of the surgeon paying close attention to the patient, including taking a thorough and comprehensive medical history and fostering a trusting relationship with the patient. By using this algorithm, which considers the

patient's unique data, the surgeon can plan the surgical intervention in a way that restores the proper balance between the facial subunits. Consequently, the authors suggest various surgical methods for correcting the midface, such as the subperiosteal elevator, lipofilling, rhytidectomy, and SMAS-lift. In all cases, it is highlighted that the algorithm allows for a personalized approach to the problem, and the multi-stage nature of the algorithm allows for staged interventions years after treatment.

Algorithms in aesthetic surgery of the lower third of the face

C. Botti and G. Botti (2015) discussed their practical experience with deep dissection SMAlift, which involves varying degrees of action [28]. For over 15 years, they have standardized the operative technique and approach, which includes a set of common steps for all cases and subjective variations tailored to each specific deformity, patient's sex, and age. Preoperative examinations aim to provide patients with accurate and comprehensive information about surgical techniques and potential complications, as well as to decide on the best options for them. The surgeon and patient must collaborate to determine whether the surgery should be limited to the lower cheeks and neck or extended to the midface and temporal-frontal region. Additionally, they must decide whether to perform concomitant dermabrasion for wrinkles and skin imperfections, blepharoplasty (with or without canthopexy) for eyelid issues, and other procedures that contribute to a more harmonious and complete rejuvenation result. Techniques aimed at restoring lost volumes due to bone and fat atrophy play a crucial role in these procedures. In 80% of cases, facelift was combined with lipofilling. In 10% of instances, facial implants were used, mainly for the chin and cheekbone area. The use of liposuction to remove excess fatty tissue was also common.

Conclusion

The examination of literature has revealed a broad array of scientific investigations that concentrate on the advancement and application of algorithms in various specialized areas of facial aesthetic surgery. All of the authors involved in these studies concur that incorporating algorithms into clinical practice is highly effective, with some having developed these algorithms for the first time. When it comes to planning and carrying out surgical procedures, there is a strong emphasis on relying on individual patient data, as well as the significance of creating and utilizing algorithms that are tailored to the work of an aesthetic surgeon in order to achieve better surgical outcomes. In certain situations, incorporating algorithms into clinical practice has resulted in notable enhancements to patients' post-procedure quality of life. While it is acknowledged that rigorosity is necessary when addressing all parts of the body due to intricacy, the face holds a unique appeal for both surgeons and patients. Scientific literature highlights the benefits and practical relevance of addressing the upper and middle sections of the face. However, as of now, cases of creating and applying algorithms for the lower third of the face have not been documented in scientific literature. There are generally two main types of corrective interventions in the lower third of the face, which are aimed at either soft tissues or bone structures, including acquired defects.

There are various approaches to performing corrective interventions for each type, such as the commonly used SMAS-lifting with its variants like Deep Plane, High SMAS, Low SMAS, and others, which differ in three main principles, including: 1) the extent of radical dissection; 2) the direction and strength of pulling lifted flaps; 3) methods of fixation. Each method of correction has its own effectiveness. The development and implementation of algorithms in clinical practice have shown positive results, indicating that the development of aesthetic intervention algorithms in the lower third of the face could lead to: 1) improved aesthetic outcomes; 2) enhanced quality of the intervention; 3) reduced number of interventions needed to achieve a positive and long-lasting effect; 4) decreased likelihood of short-term and long-term postoperative complications; 5) reduced treatment costs and shortened treatment times.

However, some experts express concerns that incorrect or error-prone development of such algorithms could limit the surgeon's ability to select more appropriate methods of intervention and worsen the clinical outcome of treatment. This should be given special attention.

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