

Systematic Review

The integration of surgical and dermatological techniques in the treatment of cutaneous aging: multidisciplinary approaches and clinical outcomes - a comprehensive systematic review of current literature

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Received: 27 March 2024

Revised: 03 April 2024

Accepted: 05 April 2024

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ABSTRACT

This comprehensive review explores the integration of surgical and dermatological techniques in treating cutaneous aging, highlighting the evolution of anti-aging strategies towards more refined and less invasive methods. As aging skin results from a combination of intrinsic and extrinsic factors, leading to structural and physiological changes, dermatology has advanced to offer multifaceted treatment approaches. We aimed to review advances and evolution in surgical interventions such as facelifts and blepharoplasty. We will discuss noninvasive and minimally invasive techniques, such as Ultherapy and fat grafting, which are widely used and are the best alternatives to traditional surgery. Other techniques, such as thread lifts and novel materials like polydioxanone (PDO) and polylactic acid (PLA) threads, are also reliable techniques for minimally invasive facial rejuvenation.

Keywords: Rhytidectomy, Blepharoplasty, Laser-assisted liposuction, Autologous fat grafting, Ultrasound therapies

INTRODUCTION

Visible aging skin is a natural process of human aging mosaic, showing the distinct passage of time. Anti-aging strategies are now being widely followed worldwide, including a blend of preventative measures, cosmetological practices, and topical and systemic treatments alongside invasive procedures. Cutaneous aging is caused by intrinsic factors such as genetics, hormonal shifts, and metabolic processes, as well as extrinsic factors such as exposure to ultraviolet (UV) radiation, pollution, insufficient nutrition intake, excess use of chemical products on the skin, and other environmental aggressors. All these factors influence the

skin, leading to structural and physiological changes across all skin layers, manifesting distinctly in sun-exposed areas.¹

Intrinsic aging yields skin that appears thin, finely wrinkled, and dry. Extrinsic factors such as long-term UV exposure accelerate skin aging, causing deep wrinkles and pigmentation issues; ultimately, skin becomes saggy and loses its elasticity. Critical dermal components, collagen, elastin, and glycosaminoglycans (GAGs), become degraded, and the skin shows signs of aging. Despite the inevitability of aging, dermatology has evolved to counteract these effects, promoting a paradigm of “successful aging” while minimizing signs of aging.

Dermatology aims to manage skin aging and integrates preventative dermatology to preserve skin health and aging signs and preempt certain conditions like skin cancer. With a combination of local and systemic therapies, advanced devices, and invasive techniques, the main goal is to achieve a skin appearance that is healthy, young, smooth, and resilient, aligning with individual patient desires for aesthetic improvement.¹

METHODS

Inclusion criteria

Only those studies that discussed individuals experiencing signs of cutaneous aging, including wrinkles, sagging skin, and volume loss, were included. Studies that discuss surgical, noninvasive, or minimally invasive anti-aging treatments were included, and most of the papers published in the last five years are selected to keep our research current. It is clarified that only relevant, peer-reviewed papers are selected.

Exclusion criteria

We excluded those papers that are unpublished. Case reports and papers with limited generalizability are excluded. Those papers that discussed individuals with active skin infections or conditions that could affect the treatment outcome were promptly excluded. All the other

papers discussing other skin problems rather than aging issues were excluded.

Literature search strategy

A systematic literature review was conducted across several databases, including PubMed and Scopus, to identify studies integrating surgical and dermatological techniques in treating cutaneous aging. Keywords and phrases related to surgical interventions, noninvasive treatments, and dermatological advancements in anti-aging were utilized. The search was restricted to articles published in English from January 2000 to April 2023. Reference lists of relevant studies were also reviewed to identify additional sources.

Selection criteria

Studies were included based on the following criteria: articles focused on treating cutaneous aging using surgical, noninvasive, or minimally invasive techniques; studies that provided clinical outcomes, patient satisfaction metrics, or comparative analyses of different treatment modalities; and reviews, meta-analyses, clinical trials, and observational studies were considered. Exclusion criteria included non-English articles, studies on pediatric populations, and articles focusing solely on theoretical models without clinical application.

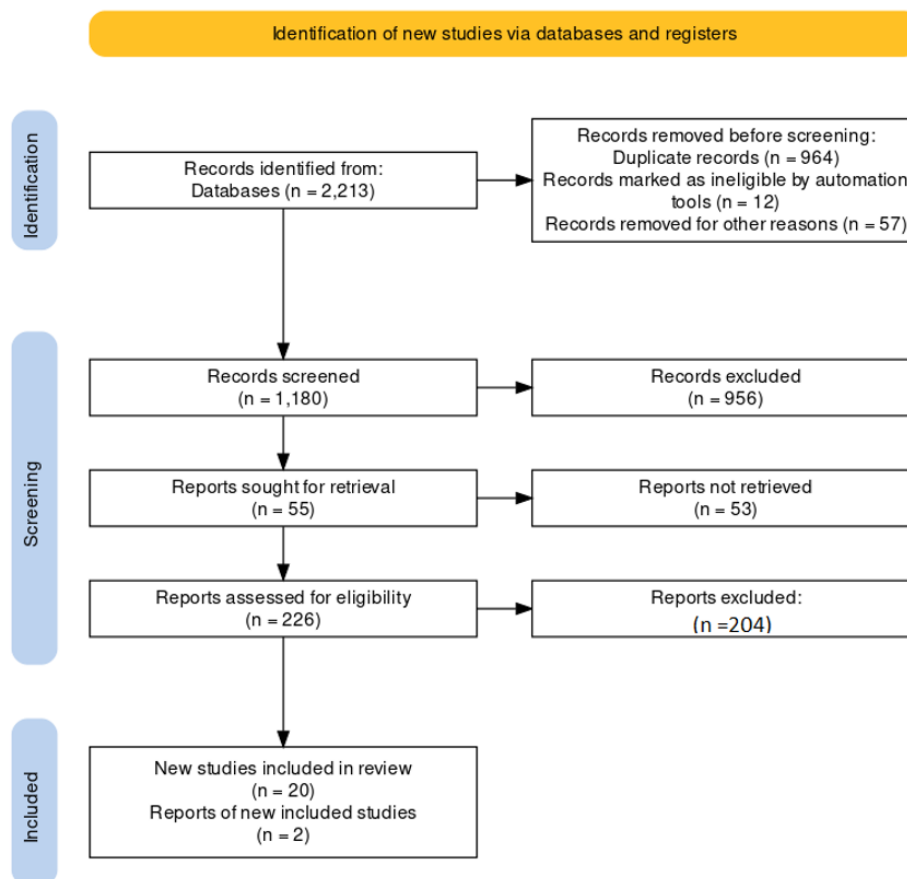


Figure 1: Flow diagram for PRISMA.

Data extraction and analysis

Two independent reviewers extracted data that included study design, participant characteristics, treatment modalities, outcomes measured, and key findings. Discrepancies were resolved through discussion. A qualitative synthesis of the findings focused on advancements in treatment techniques, clinical outcomes, and future directions in cutaneous aging treatments.

Key terms

The primary keywords were cutaneous aging, surgical anti-aging techniques, non-invasive skin rejuvenation, minimally invasive facial rejuvenation, and dermatological advancements in anti-aging. The secondary keywords are facelift (rhytidectomy), blepharoplasty, ultherapy, fat grafting, thread lifts, laser-assisted skin tightening, selected databases, and articles.

Selection

To conduct our research, we searched on PubMed and Scopus. Studies were selected based on relevance to

treating cutaneous aging through surgical, noninvasive, and minimally invasive techniques. Priority was given to recent articles (published within the last five years) that presented innovative approaches, significant clinical outcomes, or comprehensive reviews of the field. Articles were also selected based on their contribution to understanding the effectiveness and patient satisfaction of various treatment modalities.

RESULTS

Following PRISMA guidelines, this systematic and literature review identified and evaluated studies on facial rejuvenation techniques. Our initial pool included 2,213 records. Rigorous screening and assessment processes led to the inclusion of 20 studies selected from the database, and 2 other studies were included with a manual search on Chrome—selected studies on surgical advancements, nonsurgical innovations, and clinical efficacy in facial aesthetics. Key areas covered include rhytidectomy, blepharoplasty, laser-assisted liposuction, autologous fat grafting, and ultrasound therapies.

Table 1: Summary of findings.

S. no.	Author (s)	Year	Key terms	Methodology and results
1	Gancevičienė et al ¹	2012	Anti-aging, skin rejuvenation, dermato-endocrinology, aging prevention	Reviews anti-aging strategies covering dermal and epidermal signs of aging. Discusses preventive measures, cosmetological strategies, and therapeutic agents for skin bio-revitalization and rejuvenation
2	Barrett et al ²	2016	Rhytidectomy evolution, techniques	Traces the evolution of facelift techniques from rudimentary to sophisticated methods, emphasizing ongoing research needs
3	Yang et al ³	2023	Rhytidectomy, facelift techniques, complications management	Explores technical aspects of rhytidectomy, emphasizing precise surgical skills and interdisciplinary collaboration for successful outcomes
4	Rebowe et al ⁴	2023	Blepharoplasty	Describes surgical planning and complications management in blepharoplasty for aesthetic and functional improvements
5	Lee ⁵	2024	Ponytail lift	Presents endoscopic deep plane facial rejuvenation technique focusing on aesthetic improvements and aging signs mitigation
6	Han et al ⁶	2024	Laser-assisted liposuction in Asian rhytidectomy	Evaluates combining laser-assisted liposuction with rhytidectomy for greater satisfaction and lower-face fat reduction
7	Wang et al ⁷	2024	Microfocused ultrasound and delicate pulsed light	Conducts a prospective study on combining microfocused ultrasound with delicate pulsed light for facial rejuvenation, showing superior results
8	Strong et al ⁸	2024	Autologous fat grafting	Reviews advancements in autologous fat grafting for facial rejuvenation
9	Frankeny ⁹	2024	Fat grafting in facial plastic surgery	Explores advancements and techniques in fat grafting for facial augmentation
10	Prescher et al ¹⁰	2023	Autologous fat grafting to reverse radiation-induced fibrosis	Investigates the therapeutic potential of autologous fat grafting in reversing radiation-induced skin fibrosis
11	The rise of thread lifts ¹¹	2020	Thread lifts in aesthetic rejuvenation	Analyzes the resurgence and technological advancements of thread lifts for minimally invasive facial enhancement

Continued.

S. no.	Author (s)	Year	Key terms	Methodology and results
12	Faustino et al ¹²	2023	Laser-assisted liposuction for umbilical sagging treatment	Describes the application of laser-assisted liposuction for aesthetic umbilicus reshaping
13	Khan et al ¹³	2021	Micro-focused ultrasound (MFU) therapy	Reviews the efficacy of MFU therapy for skin tightening and rejuvenation
14	Amador et al ¹⁴	2023	Limited incision facelifts	Systematically reviews the safety and effectiveness of limited incision facelifts
15	Functional outcomes of upper eyelid blepharoplasty ¹⁵	2023	Functional outcomes of upper eyelid blepharoplasty	Systematically evaluates the functional effects of upper eyelid blepharoplasty post-surgery
16	Shtraks et al ¹⁶	2019	Longevity of endoscopic midface lift	Investigates the efficacy and durability of endoscopic midface lift using objective measurements and validated aesthetic scales
17	DiBernardo et al ¹⁷	2009	Skin tightening after laser-assisted liposuction	Prospective evaluation of skin elasticity improvement and shrinkage post-laser lipolysis
18	Li et al ¹⁸	2022	Nonsurgical modalities in facial aging improvement	Reviews minimally invasive techniques for facial rejuvenation including facial injectables and antiwrinkle technologies
19	Schiraldi et al ¹⁹	2022	Facial fat grafting complications	Systematically reviews complications of facial fat grafting categorizing them by severity
20	Kauke-Navarro et al ²⁰	2024	Facial implant materials in craniofacial surgery	Reviews various facial implant materials and their applications in craniofacial surgery
21	Contreras et al ²¹	2023	PDO threads in facial rejuvenation	Reviews PDO thread use in facial rejuvenation, highlighting gaps in research on insertion techniques and safety
22	He et al ²²	2023	Skin aging and active anti-aging ingredients	Investigates active ingredients targeting skin rejuvenation, emphasizing the need for further research

Surgical techniques in the treatment of cutaneous aging

Surgical interventions for addressing cutaneous aging have evolved significantly over the past decade, leveraging advanced technologies and innovative techniques to offer more refined, effective, and less invasive options. While traditional methods like facelifts and blepharoplasty remain foundational in the arsenal against aging, newer modalities have emerged, reflecting advancements in surgical precision, patient comfort, and recovery times.

Rhytidectomy

Rhytidectomy, commonly known as a facelift, has evolved significantly since its inception in the early 20th century, transitioning from simple skin tightening procedures to more complex techniques that reposition facial tissues for a youthful appearance. Initially, facelifts were rare due to societal skepticism towards cosmetic surgery and a lack of openness among surgeons. This technique became famous in post-World War I, and in this era, some crucial innovations were made, such as the SMAS technique, introduced by Mitz and Peyronie in 1976, which is fundamental to modern facelifts.²

Facelifts represents changing the superficial musculoaponeurotic system, aiming at successful results that can last longer. Moreover, development in that field

will be seen after Hamra's creation of the tri-plane and deep-plane techniques in the 1980s and the 1990s, which address the neck and cheek areas for a more comprehensive rejuvenation. Nowadays, people may undergo facelifts, and the procedure is personalized for specific needs, such as chin or neck lifts or facial volume loss. The perfect arrangements in these practices hinge on the profound knowledge of facial anatomy, especially placement of the facial nerve and how aging affects the structures of the face. Facial aging is a process that causes skin laxity, facial fat descension, and skeletal changes, giving the characteristic wrinkles and hollow cheeks. Facelift or face surgery handles these issues by carefully maneuvering the tissues and removing excessive skin. The approach, either SMAS rhytidectomy, deep-plane, or composite facelift, is based more on the aging pattern and the patient's vision of their goals. Adjuvant therapies such as brow lifts and laser resurfacing are usually utilized together with facelifts to achieve a holistic approach to face refurbishing; this means that the individualized treatment plan must be designed to obtain satisfying results with no signs of surgery. The rhytidectomy modality has been thoroughly transformed by innovations that can now cater to tailored, less invasive procedures and, consequently, long-lasting results. In this list, the SMAS technique stands out for its power to obtain more natural and longer-lasting lifting by manipulating the deeper layers of the face. This technique, including its different

versions, such as the deep-plane and composite rhytidectomy, gives pleasing facial contour and rejuvenation results. It does not touch solely the skin but also the underlying muscles to yield even better results. The MAC'S lift is the next vital step, providing a less invasive advantage with a fast recovery period.

Using smaller incisions and placing the tissues in different positions of the face thus attracts patients who need significant rejuvenation but will only have a little downtime after surgery, which will help increase the acceptability and popularity of the surgeries. The range of facelift procedures has been extended through the alternation of additional procedures, such as blepharoplasty for the treatment of eyelid rejuvenation, autologous fat transfer for volume increase, and laser rash for skin texture impact. These concomitant treatments make one single surgical session a merely holistic approach that simultaneously deals with facial aging as well as with the quality and volume of the skin. This all-encompassing strategy elevates the final beauty effect and comes up with a customized plan that tackles all facial aging signs. More advanced anesthesia procedures and longer rehabilitation protocol improvements are responsible for safer postoperative care and shorter recovery. Considering new materials in sutures and types of wound closure techniques, doctors can now minimize scars and improve healing, ensuring patients will be more pleased with the outcomes, which will remain unnoticeable.³

Blepharoplasty

Blepharoplasty, also known as eyelid surgery, addresses aging signs around the eyes, such as drooping eyelids and under-eye bags. Blepharoplasty does not only mean removing excess skin and fat but there are other factors to consider, such as preservation of eyelid function and aesthetic balance while avoiding an overcorrected look. For example, transconjunctival approaches used for lower eyelid surgery will allow fat removal or repositioning without external incisions, reducing visible scarring and recovery time.⁴

Blepharoplasty—reshaping the eyelids—has remained one of the most popular cosmetic procedures, illustrating the persistent changes in aesthetic and reconstructive facial surgery and many other medical fields. Undoubtedly, the latest generation of blepharoplasty technology has been designed to provide a functional and aesthetic lift to both upper and lower lids, with great strides in safety and efficacy and in the types of cases that can be treated.

Dedicated initially to removing excess skin and fat, rejuvenating the eyes and surrounding skin has become more or less obligatory. Initially, the methods mainly focused on the outside of the eyelid, commonly ignoring or disregarding the periocular area's delicate and complicated anatomy and functional dynamics. Over a long time, a deeper comprehension of the eyelid anatomy,

including the parts of the orbital septum, tarsal plates, and canthal tendons, has detailed stronger techniques that have led to more personalized repair. This phenomenon reveals a global trend in plastic surgery to carry out operations, which, while they help achieve aesthetical results, also show anatomic integrity.⁴ A prominent new trend in blepharoplasty is an emphasis on the function of eyelids by preventing adverse cuts such as lagophthalmos and ectropion, which were highly likely to occur in procedures of intense parts of eyelids that were a lot. Today, strategies endorse the sensitivity of sophisticated assessment plus personalized surgical design. Surgeons now frequently just reposition fat to fill hollows and bulges and, this way, obtain a more realistic contour and better indicate the downfold and the line of the half-eye-lid at the same time.⁴

Current developments in orbital rejuvenation, like refined lateral tensioning techniques to support eye position, minimally invasive transconjunctival methods lowering skin lesions, and combo therapies like blepharoplasty with laser resurfacing for the most exact outcome, are of particular interest. Insertion of fat tissue or fillers, in addition to the incision, which is familiar with the traditional blepharoplasty, enhances volume/ fullness. Advanced imaging has increased the cure rate and prevention of wasting, and the use of youthful volume accounts for only the volume of fat that needs attention. Up-to-date science demonstrates enhanced safety, accompanied by patient comfort, whereby their drowsiness scores are on the lower side, and private practice affords time to deal with the peculiar features of each patient.⁴

Endoscopic facelift technique

Endoscopic facelifts are one of the cutting-edge techniques where wireless endoscopic cameras are used, and this strategy has revolutionized facial rejuvenation by offering enhanced visibility and providing more precision during surgery. It is a minimally invasive technique that needs tiny incisions, and an endoscope, i.e., a thin tube with a camera, is needed, which allows surgeons to lift and reposition tissues with minimal scarring and reduced recovery time. The endoscopic facelift technique is usually used for midface and brow areas that combat aging signs effectively, yielding more natural-looking results by preserving natural facial expressions. The latest advances in endoscopic facelift techniques include the introduction of 3D imaging for greater anatomical accuracy and the combination of endoscopic methods with nonsurgical treatments for comprehensive rejuvenation. This technique has elevated aesthetic outcomes while ensuring quicker, safer recovery processes.⁵

Laser-assisted skin rejuvenation

The laser-assisted skin tightening method, a minimally invasive technique, can constitute something new by providing an effective solution to skin sagginess with a short recovery time. This technique has ventured into the

arena of using laser technology, which is the crucial reason for its preeminence in surgical confronts, characterized by a receding recovery time compared to traditional surgeries. Various impressive research studies have mentioned the appearance of these miraculous machines, which can target an exact wavelength and create a controlled skin contraction. The "Happy protocol" is the first to treat umbilical sagging, which is not commonly done, with a 980-nm diode laser, which can be up to 30% better than the initial state. The process triggers collagen production through particular laser wavelengths. Therefore, the tissue gets the lift and pulls action. The benefits include minimal discomfort, faster healing, and a natural appearance of the results, whereby customized treatments are appropriate for each person. A skin tightening procedure with a laser is a big step for aesthetic surgery; it renders a safe and reliable treatment for slackening skin. The happy protocol is one of those innovations; there will be assured improvements in patients' level of wellness and quality of life.⁶

Ultherapy noninvasive facial rejuvenation technique

Ultherapy is a nonsurgical evaluation with the help of intense-focused ultrasound (IFUS) technology, which initiates the collagen-maker process for face and neck skin revitalization. This laser delivers thermal energy to the tissues at precisely measured depths, promoting neocollagenesis and elastin remodeling. Not only that, it leaves all the skin surface undamaged. Ultherapy commands attention for its ability to reach the deeper layers of the skin with maximum precision and minimal side effects. Thus, elongated healing time is not a mandatory follow-up as in the case of other procedures. Resolutions of its high-resolution imaging capability guarantee the right targeting, minimizing the amount of damage. The uniqueness of this method in comparison to the others is the clarity of images acquired. Clinical trials demonstrate that Ultherapy is grasping patients' attention, and substantial mid- and lower-face improvements are observed. It is mentioned as one of the safest treatments offered in beauty services, with non-reversible adverse reactions and unlimited use across all skin, giving it a broad application to solve the problem of skin laxity. The new standard for tumescent liposuction is considered to be Ultherapy - a very efficient procedure for nonsurgical facial rejuvenation, which has a lasting, safe, and sound result. This methodology provides a solution if you are looking for nonsurgical options, altering the idea of noninvasive aesthetic procedures with satisfying results for a lovely young appearance.

Fat grafting

Fat grafting has also gained prominence in the field of cosmetic surgery, addressing volume loss more naturally by using the patient's fat to restore youthful fullness to the face. Fat grafting technique not only improves skin quality with the use of stem cells and growth factors. Advances in fat grafting technology have significantly broadened its application in cosmetic and reconstructive surgery, which

influences facial augmentation and the treatment of radiation-induced skin fibrosis.⁸

Fat grafting is increasingly used for facial augmentation due to its ability to utilize the patient's tissue because it is a natural alternative to implants. In this technique, fat is harvested from the body, and then it is purified and injected into those facial areas that need volume improvements, like cheeks and contours. It can be used in other facial areas like under the eyes, lips, and temples. Recent advancements include refining the fat to smaller and more granular particles that give a smoother appearance. Nano-fat grafting is another advancement that includes fat emulsification into a solution of stem cells and growth factors to improve skin quality without necessarily increasing volume. Nano-fat grafting yields more natural results and improves skin quality alongside volume enhancement.⁹

Radiation-induced skin fibrosis is a common consequence of radiation therapy and leads to skin thickening, reduced elasticity, and pain. Fat grafting, particularly autologous fat grafting, has shown promise in reversing these effects. The procedure involves using adipose-derived stem cells (ASCs) from the patient's fat. These cells and the stromal vascular fraction (SVF) stimulate angiogenesis and disrupt pro-inflammatory pathways, offering a regenerative effect on the damaged tissues.¹⁰

Thread lifts

The human age achievement of thread-lifts has undergone considerable transformations, and they are now used as a trending tool for effective facial rejuvenation with minimal surgical procedures. Therefore, these remainder have made the lifting of skins a safer and more effective method. The latest thread technologies incorporate dissolvable and stronger strands, which allow the re-drape of the subcutaneous tissues, chiefly in the lower third of the face, that are intertwined and ineffective in correcting with injectables. This enables the desired slimming of the jawline and marionette line, decreasing the heaviness. Create your business scenario from scratch. Innovations, such as polydioxanone (PDO) threads, containing a wide range of styles by which patient can experience the formation of their collagen in varying proportions and time, continue to be highly appealing for their balance of long-term effects and comparable to collagen production. Apart from those of polylactic acid (PLA, PLLA) and polycaprolactone (PCA), a multitude of sutures for different layers of the skin and its collagen support are now available, acting deeper for the ray of increasing volume and lifting.¹¹

While thread lifting works best with other services, such as Sculptra, it is noteworthy that it can be integrated with muscle movement and profile development for a more youthful look. PDO threads give tangible uplifts and stimulate collagen levels that offer sustainable results

when combined with dermal fillers to make up aesthetically pleasing faces.

DISCUSSION

Dermatology and cosmetic treatments are advancing rapidly, with a significant shift towards minimally invasive techniques and robotics. These innovations offer precise outcomes and shorter recovery times, enhancing patient satisfaction. Clinical studies demonstrate improved success rates and quality of life post-treatment. Additionally, the introduction of new therapeutic compounds and non-invasive procedures, such as topical retinoids and laser therapies, has greatly improved the management of skin aging. While skin quality and appearance are key indicators of effectiveness, clinical research suggests that they only represent part of the overall impact.¹²

In a 2023 study by Amador et al limited incision facelifts were found to be safe and effective alternatives to traditional methods. Analyzing 20 articles and 4451 patients, the study reported a low complication rate of 4.0%, with hematoma and temporary nerve injury being the most common issues. The use of drains or tissue sealants was associated with lower complication rates. Limited incision facelifts offer favorable outcomes with a reduced risk profile compared to more invasive procedures.¹⁴

Hollander et al found that upper eyelid blepharoplasty offers functional improvements like enhanced visual fields and reduced headaches, but results regarding eyebrow height, astigmatism, contrast sensitivity, and eyelid kinematics were mixed, necessitating further research. Shtraks et al study on the longevity of the endoscopic preperiosteal midface lift revealed significant and long-term improvements in midfacial height for up to 15 years post-surgery. The technique effectively enhances midface appearance without entirely disrupting midfacial ligaments, challenging the notion that complete ligament division is necessary for long-term results.¹⁶

A study by DiBernardo et al that was published in 2009 in the *Aesthetic Surgery Journal*, explored the magnitude of skin tightening achieved after laser lipolysis. The potential effects were evaluated on four females with belly adiposity and treated with 1064-/1320-nm sequentially firing laser. The thickness of the skin was measured by Tattoo Enlightenment in four quadrant sectors using a 3D camera, and skin elasticity improvement was assessed using a skin elasticity machine. At the three-month follow-up, the results were encouraging, as there was a significant rise in the mean elasticity score of 26% and a skin shrinkage of 17% compared to the initial reading. The study took care of the measurement of skin tightening and shrinkage contribution from laser addition to liposuction, representing a new qualitative witness for the improvement of cosmetic surgery outcomes.¹⁷

The study published in December 2021 by Khan et al investigates the effectiveness of micro-focused ultrasound (MFU) as a non-invasive method for skin rejuvenation. Amidst the growing demand for nonsurgical aesthetic procedures, MFU emerges as a promising technology, noted for its ability to stimulate significant wound healing responses, including robust collagen remodeling. This review analyzed ten full-text articles selected from PubMed and Science Direct databases, focusing on the use of MFU in patients aged 35-65 for enhancing skin aesthetics, particularly in the mid and lower face. The findings highlight the method's efficacy in achieving notable improvements in skin tightness and aesthetics without significant side effects, underscoring the long-lasting nature of the results. Unlike other skin-tightening approaches, MFU uniquely targets deeper tissue layers while sparing the epidermis, offering a distinct advantage in safety and effectiveness. Both patient self-assessments and clinical evaluations reported high improvement rates, positioning MFU as a valuable tool in the arsenal of non-invasive facial rejuvenation techniques.¹³

Facial fat grafting (FFG), utilizing autologous fat for volume augmentation and skin improvement, is increasingly popular, with over half a million procedures annually. According to various studies, the hypothetical general complication rate is about 2%; a systematic review by Schiraldi et al revealed a more comprehensive complication range from 1.5% to 81.4%, which means it can have side effects from moderate to even severe. His results showed that fat grafting could have severe effects, accounted 13.4%, including intravascular injection or migration, leading to neurological problems and often resulting in permanent disability or death. Moderate side effects were about 38.3% among patients, like fat hypertrophy, necrosis, cyst formation, and asymmetries necessitating corrective surgery. The minor effects rate was 48.3%, including prolonged swelling or redness and not needing any treatment. Schiraldi et al underscores a need for standardized reporting and research to accurately determine the procedure's safety profile among those who underwent fat grafting.¹⁹

PDO, an alternative to traditional facelift surgery, which is a minimally invasive approach to facelifting, attracts a lot of attention for its low risk of complications and collagen production. Even though these surgical threads are a hit with beauty experts, the literature on the scientific basis of PDO threads is insufficient, pointing out the critical lack of well-conducted studies. This evaluation suggests that no well-known techniques exist for safe thread risk. A more extensive study should be conducted to illuminate more potential developments. From a clinical point of view, it has been reported that PDO threads, in combination with fillers, can effectively restore tissue and collagen with excellent efficiency. Hence, the lifting and stimulation of collagen occur. Even though PDO performs well in retaining facial volume, its longevity and the comparison of the result with innovative materials such as PCL threads remain unclear. The existing research primarily comes

from Asia, which demonstrates a bias in the region's research direction. The lack of purposeful data on implications, together with the varied experiences of the workers, creates an urgent need for practical, well-controlled studies that will ensure the safety, efficacy, and appropriateness of usage of sudden death syndrome (PDO) threads in skin anti-aging.²¹

PDO threads offer a minimally invasive alternative to traditional facelift surgery, stimulating collagen production with fewer complications. However, the scientific literature lacks comprehensive studies supporting their efficacy and safety, highlighting the need for further research. Clinically, PDO threads, especially when combined with fillers, show promise in tissue rebuilding and collagen enhancement. However, the duration of results and their comparison to advanced PLL threads remain unclear. Insufficient data and regional disparities underscore the necessity for well-designed studies to establish the safety and effectiveness of PDO threads in anti-aging skincare.²⁰

Nonsurgical skin tightening procedures such as micro-focused ultrasound (MFU), high-intensity focused ultrasound (HIFU), and others like radiofrequency treatments are increasingly recognized for their effectiveness in facial rejuvenation. These technologies aim to improve skin elasticity, reduce sagging, and enhance overall skin appearance by stimulating collagen production without invasive surgery. Research by He et al discussed the future of skin aging. Research emphasizes understanding and combating the mechanisms driving skin deterioration. Focus areas include oxidative stress, inflammation, photoaging, and glycosylation. Key strategies involve harnessing natural and synthetic compounds, enhancing antioxidant defenses, and improving pharmaceutical formulations for targeted delivery. Despite advancements in identifying active anti-aging ingredients, the search for ideal compounds continues. Future directions include exploring novel mechanisms, sourcing new active ingredients, and developing enhanced delivery systems to counteract skin aging effectively.²²

CONCLUSION

Morphometric features of transverse and sigmoid sinus with other superficial landmarks is essential during posterolateral approaches to the posterior cranial fossa. The measurements of asterion with other bony landmarks provide database for the clinical-surgical practice and also for forensic and anthropological application.

Recommendations

The important points of reference on the posterolateral surface of the skull are asterion, inion, apex of the mastoid process and suprameatal crest. The objectives of the present study were to determine the type of asterion depending on the presence or absence of sutural bone, to

measure the linear distances of asterion from various bony landmarks, the nearest distance of the same from sigmoid and transverse sinus and also the thickness at the centre of the asterion that may be of importance to anthropologists, anatomists, forensic pathologists and neurosurgeons.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: Not required

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Cite this article as: Portilla ASP, Portilla CSP, Palacios GSG, Rodríguez BSP, Castillo SGA, Espin NEP, et al. The integration of surgical and dermatological techniques in the treatment of cutaneous aging: multidisciplinary approaches and clinical outcomes - a comprehensive systematic review of current literature. *Int J Res Med Sci* 2024;12:1659-67.