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Short Communication

Exploring the metaverse of facial aesthetic procedures

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ABSTRACT

Face cosmetic surgery aims to enhance a patient's facial appearance through various procedures like rhinoplasty, blepharoplasty, rhytidectomy, browlift, genioplasty, otoplasty, liposuction, and fat transfer, often used to address aging-related changes.

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1. Introduction

Facial plastic surgery is a multidisciplinary specialty that includes otolaryngology, oral maxillary surgery, dermatology, ophthalmology, and plastic surgery. It focuses on reconstructive and cosmetic operations like rhinoplasty, browlifts, and facelifts. The American Academy of Facial Plastic and Reconstructive Surgery was established in 1964, and most surgeons in the US focus on cosmetic procedures using injectable fillers, neural modulators, and lasers.¹ However, mainstream media perpetuates a limited concept of beauty, leading to depression and age-based discrimination, negatively impacting mental health.

2. Surgical Procedures

- 1. Rhinoplasty:** Rhinoplasty is a challenging facial plastic surgery used to correct nasal pathology, modify aesthetic appearance, reduce airway obstruction, and reconstruct congenital nasal anomalies.² Over the past decade, it has evolved with structural techniques, advanced technology, and digital imaging, making it

an essential component of rhinoplasty planning.

- 2. Facelifts:** Facelifts have evolved to meet patient demands for minimally invasive procedures, with lunchtime facelifts impacting treatment for aging faces.³ In the 2000s, less invasive procedures gained popularity, with the number of facelifts performed growing by 27.7% compared to 1997.
- 3. Blepharoplasty:** Blepharoplasty is a facial procedure involving excision of eyelid skin or orbital fat to treat dermatochalasis and blepharochalasis,⁴ often performed under local anesthesia to correct lid ptosis caused by gravity, sun damage, and skin composition changes.
- 4. Forehead lifts and browlifts:** Forehead lifts are facial plastic surgery procedures that reshape excess skin and improve forehead positioning. Typically performed in women, mid-browlifts are used in men, and endoscopic surgery allows for natural changes.⁵
- 5. Hair restoration:** Hair loss is a major concern, with advancements in hair transplantation including minigrafts, micrografts, and follicular unit transplantation.⁶ However, their economic viability remains uncertain compared to traditional methods.

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3. Non-surgical Procedures

1. **Chemical peels:** These involve agents like glycol acid, trichloroacetic acid, and phenol, which penetrate the skin's epidermis into the dermis.⁷ These agents cause skin destruction and stimulate regenerative pathways.
2. **Dermabrasion:** It is another technique used to smooth deeper scars and wrinkles, performed under anesthetic or freezing, using a high-speed rotating brush or sandpaper.⁸
3. **Lasers:** Lasers can be used to treat scarring, photodamaged skin, facial wrinkles, and aging symptoms with minimal damage and minimal bleeding. Ablative lasers promote the formation of collagen by heating the dermis. Erbium:yttrium-aluminum-garnet (Er:YAG) and pulsating CO₂ are frequently employed as wavelengths.⁹ Non-ablative lasers cause focal heat damage, promoting collagen formation. Fractional photo-thermolysis combines traditional ablative procedures for quick healing.
4. **Fat grafting:** A common cosmetic operation is fat grafting, which entails manually removing excess fat and carefully injecting tiny amounts of tissue into the neck, orbit, temporal fossa, midface, and other locations. Although it has been disputed if mesenchymal stem cells are injected during this procedure, it is a crucial part of facelifts for many people. Graft survival from autologous fat grafting varies, although research is being done to increase it.
5. **Dermal fillers:** Dermal fillers, including collagen, hyaluronic acid, calcium hydroxylapatite, and poly-L-lactic acid, are temporary treatments for aging and wrinkles. Polymethyl methacrylate is the only permanent filler approved by the FDA for nasolabial fold correction.¹⁰ Hyaluronic acid is the primary facial filler, while calcium hydroxylapatite is approved for lipoatrophy treatment. Bellafill, a third-generation filler, is used for facial structures, but concerns remain about late-onset adverse effects and displacement.
6. **Botulinum toxin:** The most common cosmetic operation in the US is the injection of botulinum toxin to repair wrinkles on the face. The FDA has approved three different serotypes of botulinum toxin A (BoNTA) for use in cosmetics: incobotulinumtoxin A (Xeomin), abobotulinumtoxin A (Dysport), and onabotulinumtoxin A (BOTOX Cosmetic).¹¹

4. Reconstructive Surgery

Trauma frequently results in facial fractures, such as Le Fort fractures, zygomaticomaxillary complex (ZMC) fractures, and mandibular fractures. Traditional techniques for ZMC injuries include internal fixation and open reduction, but endoscopy offers in situ reduction. Advancements in face reconstruction include computer-based methods, patient-

specific implants, resorbable plates, and screws. Smaller plates are used in rigid fixation procedures for children with growing facial bones.

1. **Reanimation of the face:** Facial paralysis can result from various injuries, disorders, or viral infections. Face reanimation surgery uses neural approaches, musculofascial transposition, micro-neurovascular transfer, and prostheses to improve deformities and restore mimetic function.
2. **Microtia:** A disordered remnant of cartilage is the outcome of a congenital abnormality of the external ear called microtia. A multi-stage procedure can be used for reconstruction, while more recent developments have made a two-stage procedure possible.
3. **Otoplasty:** It is a surgical technique that uses cartilage splitting or sparing procedures to correct congenitally large ears.

5. Combining Artificial Intelligence with Facial Surgery

Artificial intelligence is revolutionizing facial aesthetics by improving diagnostic accuracy, procedural safety, and personalized patient care. This technology automates image analysis, standardizes techniques, and facilitates real-time decision-making, reducing operator variability and enhancing diagnostic accuracy. Real-time supervision during procedures reduces risks of nerve injury and vascular blockage, while post-procedural evaluations improve patient outcomes and early diagnosis. Customized treatment strategies based on each patient's anatomy and clinical requirements increase patient satisfaction. AI-powered processes can improve workflow productivity and patient satisfaction, despite ethical issues, training, and data diversity. However, data security, privacy, transparency, and standardized picture acquisition are crucial for preserving responsibility and confidence. Despite these challenges, AI technology has the potential to set new benchmarks for facial aesthetics, providing safer, more accurate, and customized procedures, resulting in better results, fewer issues, and greater satisfaction for patients and practitioners.

5.1. Aesthetic procedures and ethics

Despite the growing demand for cosmetic surgery, there are few clear ethical standards in aesthetic medicine. The shift from traditional doctor-led care to consumer-driven practices raises ethical concerns, including the monetization of beauty, conflicts of interest, lack of therapeutic evidence, and the rise of nonphysician providers. To address these issues, professional groups should establish clear ethical standards and guidelines, promoting autonomy, beneficence, nonmaleficence, and justice.

6. Conclusion

Aesthetic practitioners must address societal appearance anxieties and embrace diversity and dignity in medical aesthetics. They should avoid narrow beauty definitions and validate objective outcome measures to prevent perpetuating unrealistic beauty standards. Because of its emphasis on appearance-enhancing procedures, the area is subject to ethical limitations. Aesthetic providers should decline procedures if they don't align with patients' realistic expectations and desired outcomes. They should guide patients towards their goals in a way that upholds professional and ethical standards. A lack of well-defined ethical guidelines within aesthetic medicine necessitates the establishment of formal guidelines and ethical training standards for nonsurgical aesthetic providers.

7. Source of Funding

None.

8. Conflict of Interest

None.

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