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Complications and adverse events associated with non-invasive aesthetic medicine procedures

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ABSTRACT

Non-surgical aesthetic medicine has grown quickly around the world in recent years. Patients are choosing less expensive, less invasive treatments to stay looking young. Many people now receive treatments such as botulinum toxin injections, dermal fillers, mesotherapy, laser therapies, and skin-improvement procedures to reduce signs of aging and boost self-esteem. These procedures are usually safe and require minimal time off. But they are becoming more popular, and more and more people are reporting problems with them. The risk of complications is much higher when staff lack the proper training and procedures are performed by unqualified individuals. The use of unregistered or fake products, and poor regulatory oversight in some countries, also raises safety concerns for patients. In Poland, aesthetic medicine isn't seen as its own medical specialty. This means that some procedures might be done without the same strict rules and oversight as other medical procedures. Unfortunately, this can sometimes lead to negative results. This article reveals the most common problems which may happen during non-surgical aesthetic medicine procedures. The text discusses how vital proper preparation is to avoid issues and to address them when they arise. It also emphasizes proper training, prevention, and complication management to ensure patient safety.

Keywords: aesthetic medicine, side effects, complications, botulinum toxin

1. INTRODUCTION

The treatments are meant to make patients look better, feel better about themselves, and make visible signs of aging less noticeable. Aesthetic medicine is a relatively new field compared to other medical specialties. Since 1973, the field has grown and changed a lot (Gałęba & Marcinkowski, 2015). Aesthetic medicine has grown in popularity worldwide. The increasing acceptance of cosmetic procedures can be attributed to technological advancements and the development of novel products and treatments. The pursuit of youthfulness is a prevalent societal trend, driving increased interest in less invasive procedures that utilize regenerative medicine to restore skin.

Plastic surgery and aesthetic medicine are similar in that both focus on outpatient procedures. However, there is one main difference: aesthetic medicine uses procedures that require minimal recovery time and anesthesia. Among the treatments offered are BOTOX, dermal fillers, mesotherapy, laser procedures, chemical peels, skin rejuvenation treatments, as well as body contouring (Kononowicz & Malara, 2021). The global aesthetic medicine industry has grown a lot. From 2022 to 2023, it increased from 56.9 billion USD to 62.8 billion USD. It is all about making people look better, feeling better about themselves, and reducing the visible effects of aging. The procedure is done in a way that is not very intrusive. Aesthetic medicine is a new field compared to other medical specialties. The first association for aesthetic medicine was created in Paris in 1973 (Gałęba & Marcinkowski, 2015). Aesthetic medicine is growing in popularity. Regenerative medicine is used in these procedures to make the face look young and to restore skin.

Aesthetic medicine, unlike plastic surgery, focuses on outpatient procedures that require minimal recovery time and minimal anesthesia. The field includes a wide range of non-surgical interventions, for example injections of botulinum toxin, dermal fillers, mesotherapy, laser therapies, chemical peels, skin rejuvenation treatments, and body contouring procedures (Kononowicz & Malara, 2021). These treatments are most popular with healthy people who want to improve their appearance.

The global aesthetic medicine market has grown, hitting 62.8 billion USD in 2023 (up from 56.9 billion in 2022). This shows rising demand for cosmetic procedures, which are mostly non-surgical. These non-surgical procedures make up more than half of all aesthetic treatments. According to recent reports, the total number of aesthetic procedures increased significantly in 2022, mainly due to a big rise in non-surgical treatments, including neuromodulator injections, skin treatments, infusions, and body contouring procedures. Botulinum toxin injections are some of the most common beauty procedures in the world, with millions given each year. Soft facial fillers have become much more popular in the last ten years.

The rising popularity of aesthetic medicine has raised concerns about patient safety, mainly in countries without clear laws about it (Matthews-Kozanecka et al., 2023). Aesthetic medicine is not its own medical specialty in Poland. It can be performed by different healthcare professionals, including physicians, dentists, and sometimes by people who haven't finished their medical training. The lack of standard rules and formal qualifications may lead to more adverse events and procedural complications (Beutler et al., 2024).

Patient qualification, medical history, facial anatomy, and technical skills are essential for avoiding problems. The most common side effects of non-surgical aesthetic procedures include bruising, swelling, redness, pain, allergic reactions, lumps, unevenness, infections, and local injection-site reactions (Kononowicz & Malara, 2021). More serious complications may also occur, particularly after dermal filler administration. These include vascular obstruction, tissue death, visual impairment, and, in rare cases, blindness. Botulinum toxin injections can also cause problems like drooping eyelids or brows and unintended muscle weakness (Sethi et al., 2021). Complications are a risk. Adequate practitioner training, evidence-based practice, and safety protocols are important.

The goal of this study is to present the most common techniques used in aesthetic medicine. It will also review adverse events associated with non-surgical aesthetic procedures and discuss their clinical significance in the context of the most frequently performed treatments.

2. REVIEW METHODS

Studies between January 2015 and March 2026 provided the information in this review. The study was done using PubMed, Web of Science, Cochrane Library, and Google Scholar databases. The terms included were "aesthetic medicine", "botulinum toxin", "side effects", "mesotherapy", and "psychological aspects of aesthetic medicine." The following publications qualify: systematic reviews, original research studies, and official data statistics. Reports and articles that were not available in full were not included. The articles have gone a thorough substantive review. Our team identified 953 publications from the years January 2015 and March 2026. First, we looked at the records in the database. We checked the titles and summaries of the records to see if they were useful. After the selection stage, the full texts of all relevant articles were reviewed. In the end, we included 30 studies in this review. Studies examined common non-surgical aesthetic medicine techniques, individual substances, and their side effects. The studies also looked at the results that can be obtained. The list did not include all the healing effects of the substances. We mainly focused on the effects that improve how something looks (Figure 1).

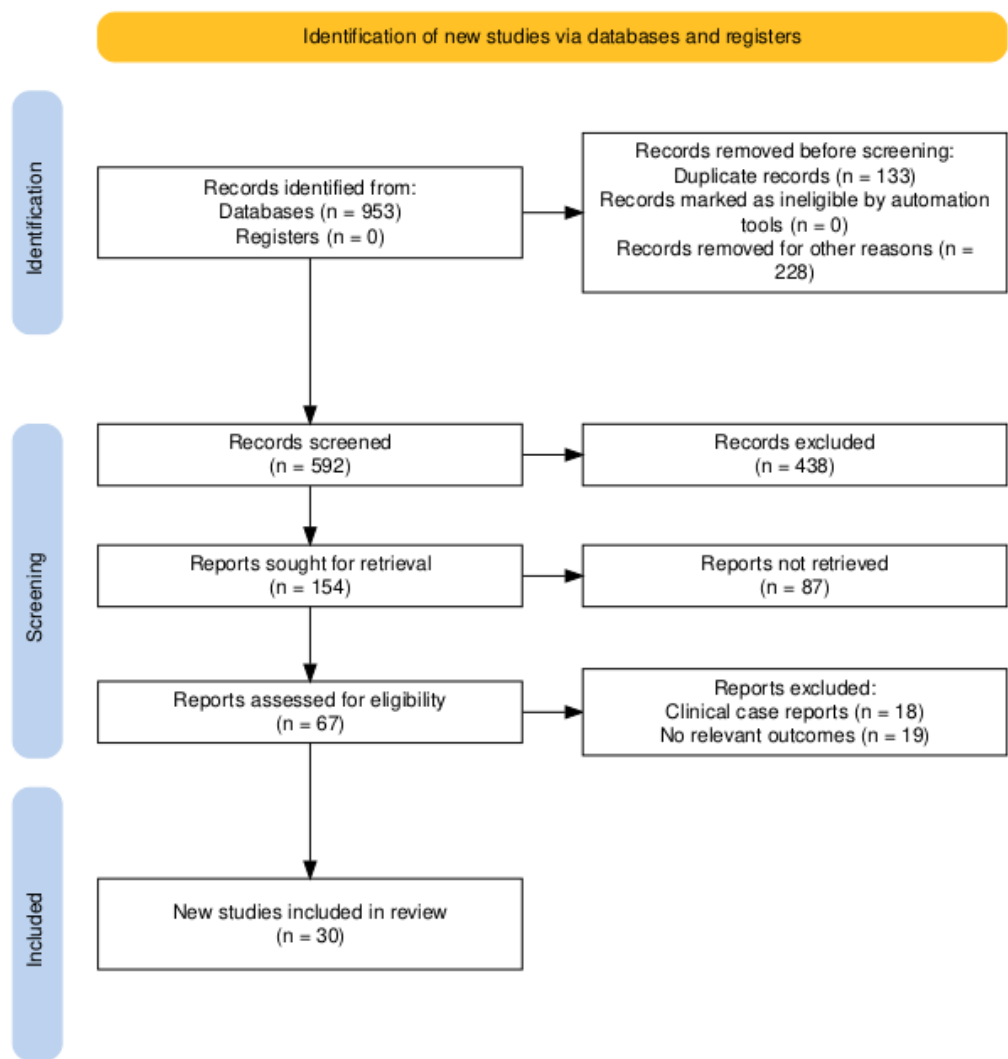


Figure 1. Flow chart.

3. RESULTS AND DISCUSSION

Botulinum toxin injections

Botulinum toxin, made by a bacterium, is an effective way to treat wrinkles. It is the most common cosmetic procedure among adults worldwide. It works by preventing the dismissal of a chemical in the nervous system that causes muscle tension. The toxin is usually given with a shot into a muscle (Kroumpouzou et al., 2021). For hyperhidrosis, however, it is given below the skin (Rummaneeethorn & Chalermchai, 2020). The effects go away on their own, and your muscles will usually work normally again in 3–6 months.

Botulinum toxin type A is the most frequently used form. The amount of this toxin used is based on the treatment area and the muscles involved. The three formulations: onabotulinumtoxin (ONA), abobotulinumtoxin (ABO), and incobotulinumtoxin (INCO) have been approved for clinical use. The differences lie in their composition and additives. Use caution with amounts. For aesthetic indications, ONA and INCO are used at the same rate. However, ABO is usually given at a rate of about 2.5:1 compared to ONA (Feng, 2020). The approved uses for botulinum toxin vary depending on the specific type of toxin. Therefore, it is essential to know the characteristics of the product and its registration details before treatment.

The most common and temporary side effects of botulinum toxin are mild (Beutler et al., 2024). The most common reactions are pain, swelling, bleeding, or bruising at the injection site. But these reactions can happen even when the procedure is done right. Patients should avoid anticoagulant medications, such as aspirin for two weeks before the procedure, unless otherwise advanced. More serious complications are usually caused by using the wrong technique when injecting the toxin. This can lead to the toxin spreading to nearby muscles, which can result in unintended paralysis.

According to Kroumpouzou et al., (2021) the upper face was the area treated most often with botulinum toxin that year. A common complication in this area is the eyebrow drooping, particularly after injections into the frontalis muscle. This may happen if you use too much or inject in the wrong place. Symptoms usually appear within 7–10 days and may last for over 4 weeks. Using the right technique, like injecting the toxin about 2–3 cm above the supraorbital rim, can help prevent this. Another possible outcome is the Mephisto sign, when the eyebrow is raised because the middle of the eyebrow is less active, but the sides of the eyebrow are still moving. To fix the problem, you need to treat the side muscle fibers again. Other reasons for asymmetry include uneven dosing, anatomical variations, or unintended toxin diffusion. Bringing balance back can be as straightforward as giving targeted shots.

The intricate anatomy of the lower face makes administering the injection more precise than in other areas of the face (Auada Souto & Souto, 2021). Excessive doses or incorrect placement can cause uneven lip symmetry and mouth closing problems. Patients may also have trouble talking or their smile may look strange (Kroumpouzou et al., 2021).

Problems from neck treatments can include pain when trying to eat (dysphagia) and weak neck muscles, especially in elderly patients (Sugrue et al., 2019). The most common side effects of BoNT are headache, dizziness, fatigue, and local inflammation. Rare but severe issues have also been reported, including allergic reactions, botulism-like symptoms, in some cases death (Ahsanuddin et al., 2021).

Mesotherapy

Mesotherapy is a type of treatment that uses injections to stimulate collagen and elastin production in the skin. It is gaining popularity because of small costs and no extensive training requirement. The treatment can be used to revitalize the skin, treat hair loss, reduce cellulite, and reduce fat tissue in specific areas. This technique can be used to deliver a variety of substances, including meso-cocktails, platelet-rich plasma, fibrin, and various bioactive stimulators. Read on to discover the problems that can arise with meso-cocktail injections. These injections often contain things called hyaluronic acid, dimethylaminoethanol, vitamin C, phosphatidylcholine, or caffeine (Szwed et al., 2023). The surgeon will choose the best one for the patient and the treatment plan.

Although mesotherapy is usually safe, there are sometimes bad reactions. These injuries can usually be prevented by doing the treatment correctly. The most common reactions are pain, redness, swelling, minor bleeding, and temporary inflammation at the injection sites (Lee et al., 2020). The following are less common but possible side effects: allergic reactions or infections at the injection site. More severe reactions, like anaphylaxis or tissue death, have been linked to certain active ingredients. Skin inflammation, fibrotic nodule formation, and, in some cases, fat death can be caused by Phosphatidylcholine (Kassir et al., 2020). Deoxycholate, a chemical in skin treatments, causes sterile panniculitis, inflammation of fat tissue, without infection (Campos et al., 2019). Some patients with lupus developed symptoms after acetyl-L-carnitine mesotherapy (AlEdani and Elgezeri, 2024).

Triiodothyroacetic acid, used to reduce cellulite, can induce hyperthyroidism due to thyromimetic activity (Triiodothyronine.com). Therefore, physicians should thoroughly review a patient's medical records and conduct thyroid function and autoimmune screening before treatment (Beutler et al., 2024). Dutasteride and mesoglycan can cause hair loss and adverse reactions in scalp mesotherapy (Gupta et al., 2023). The type of complication that occurs depends on how the medicine is given and how it works. It is important to choose the patients who will benefit most from the treatment and to be aware of the possible side effects. (Szwed et al., 2023).

Soft tissue fillers

Dermal fillers are used to make people look younger. They can also be used to fix problems caused by age or other things. There are different types of dermal fillers. They can last for a short time, a long time, or forever. The most common agents used are cross-linked hyaluronic acid and calcium hydroxyapatite, with autologous fat also used in some cases (Rayess et al., 2018). Hyaluronic acid is still the most popular choice because it has predictable results and can be reversed with hyaluronidase. To do this safely, you need to know how to choose the right product, how much to use, and how to give the shot. You also need to know about the face and the blood vessels in it. Before giving the shot, you may want to use a needle to remove the fluid from the blood vessel. Performing aspiration before injection helps reduce the chance of accidentally injecting the substance into a blood vessel (Minokadeh & Jones, 2020).

Redness, swelling, bruising, and pain. Injecting too deeply can lead to lumps or the Tyndall effect, especially in areas with thin skin are the common side effects. Hyaluronidase, administered with allergy testing, is the main treatment for hyaluronic acid-related complications (King, 2016). Damage to blood vessels also can cause serious problems. This can cause vision loss or blindness. It is most common with high-risk injections, such as on the forehead, nose, and cheeks (Carico et al., 2021). Management requires hyaluronidase, antiplatelet therapy, and ophthalmologic support, as prognosis depends on treatment speed (Bonińska, 2022).

Vascular embolization can cause problems. These problems include loss of muscle control in the eye, a stroke caused by a blockage in an artery, or, in rare cases, a fatal brain injury (Beauvais & Ferneini, 2020). One possible complication is tissue death due to blood vessel blockage, particularly in regions with many blood vessels, such as the nose and forehead. The most frequent and severe adverse events are listed in Table 1. The table shows that botulinum toxin injection reactions are usually temporary and local, while dermal fillers can lead to vascular problems.

Table 1. Summary of common complications associated with non-invasive aesthetic medicine procedures.

Type of procedure	Common problems	Serious complications	Clinical notes
Botulinum toxin injections	Pain, swelling, bruising, headache, dizziness, fatigue, local inflammation, ptosis, brow asymmetry, lip asymmetry	Dysphagia, unintended muscle weakness, botulism-like symptoms, allergic reactions	Use correct dose and technique; know facial/neck anatomy; avoid unsafe diffusion
Mesotherapy	Pain, redness, swelling, minor bleeding, temporary inflammation, infection	Sterile panniculitis, fat necrosis, lupus-like syndrome, thyroid-related adverse effects, anaphylaxis	Check medical history; assess endocrine and autoimmune risk; choose substances carefully
Dermal fillers	Redness, swelling, bruising, pain, lumps, Tyndall effect	Vascular occlusion, tissue necrosis, vision loss, blindness, stroke	High anatomical precision, aspiration when appropriate, urgent hyaluronidase when indicated

The field of aesthetic medicine has grown a lot in recent years. This includes new methods that can help with healing, like using your own cells to treat problems. These new methods have enabled more procedures that don't require surgery (Stack et al., 2026). The most common complications happen with dermal fillers and Botox injections, especially when they are done by people who do not have the right training, knowledge of the body, or formal qualifications. To ensure safe practice in aesthetic medicine, it is essential to have comprehensive medical education, a detailed understanding of facial anatomy and pharmacology, careful patient evaluation, and strict adherence to protocols based on scientific evidence. Using the wrong technique, not understanding how blood vessels are arranged, or putting the needle in the incorrect place can cause serious problems, including death (Snozzi and Van Loghem, 2018).

It is also important to use products that are approved and have been properly tested for human use. Substances that are unregistered or poorly managed may contain unknown components that can elevate the risk of infection, inflammation or stroke. Aesthetic procedures are generally seen as safe when performed by a qualified professional. But they can be dangerous. Therefore, it is essential to have an accurate technique, be aware of the anatomical zones which require more awareness, and conduct a comprehensive pre-procedural assessment to prevent complications. There is also an issue since these products are easily accessible online. Some of them are counterfeit or "Botox-like" with unknown origins and unspecified components. This may lead to unpredictable medical results, increased patient issues, and more bad outcomes.

The way it looks is influenced by technical things and by what the patient thinks is beautiful and what they expect. It is very important to talk with the patient before the procedure. This should include a discussion of expected outcomes, treatment limitations, potential risks, associated costs, and the anticipated recovery period. It is beneficial for the patient to understand what to anticipate and ensures their treatment satisfaction (Haney, 2024). Failing to manage expectations may result in disappointment, even if the procedure is executed properly.

4. CONCLUSION

The review indicates that botulinum toxin injections, mesotherapy, and soft tissue fillers each present distinct safety concerns that depend on the injected substance, anatomical site, and technical precision of the procedure. Risk reduction relies on appropriate patient selection, careful pre-procedural assessment, solid knowledge of anatomy, and adherence to evidence-based techniques. These findings emphasize that safe clinical practice in aesthetic medicine requires not only technical skill, but also thorough qualification of patients and awareness of procedure-specific complications.

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Conflict of interest

The authors declare that they have no conflicts of interest, competing financial interests or personal relationships that could have influenced the work reported in this paper.

Data and materials availability

All data associated with this study will be available based on the reasonable request to corresponding author.

REFERENCES

1. Ahsanuddin S, Roy S, Nasser W, Povolotskiy R, Paskhover B. Adverse events associated with Botox as reported in a Food and Drug Administration database. *Aesth Plast Surg.* 2021;45(3):1201-1209. doi:10.1007/s00266-020-02027-z.
2. AlEdani EM, Elgezeri H. Toxicology and side effects of mesotherapy. In: AlEdani EM, Maibach H, eds. *Mesotherapy and Its Medical Applications*. Cham: Springer Nature Switzerland; 2024:55-62. doi:10.1007/978-3-031-76070-9_5.
3. Auada Souto MP, Souto LRM. An unusual adverse event of botulinum toxin injection in the lower face. *J Cosmet Dermatol.* 2021;20(5):1381-1384. doi:10.1111/jocd.13869.
4. Beauvais D, Ferneini EM. Complications and litigation associated with injectable facial fillers: a cross-sectional study. *J Oral Maxillofac Surg.* 2020;78(1):133-140. doi:10.1016/j.joms.2019.08.003.

5. Beutler K, Rzepczyk S, Bijata B, Lewandowski J, Bożek B, Świdorski P. Complications associated with needle-based medical aesthetic procedures: clinical and medico-legal aspects from the Polish perspective. *Forum Dermatol.* 2024;10(3):61-70. doi:10.5603/fd.100842.
6. Bonińska K. Ophthalmic complications after needle-based medical aesthetic procedures: a narrative review. *J Clin Med.* 2022;12(1):313. doi:10.3390/jcm12010313.
7. Campos LM, Miot LDB, Marques MEA, Miot HA. Noninfectious suppurative panniculitis induced by mesotherapy with deoxycholate. *An Bras Dermatol.* 2019;94(6):754-756. doi:10.1016/j.abd.2019.02.003.
8. Carico R, Aspinall S, Good C. Fatalities possibly associated with hyaluronic acid injections: a review of events reported to the FDA. *Drug Ther Perspect.* 2021;37(3):137-140. doi:10.1007/s40267-020-00804-z.
9. Feng LF. Characteristics and emerging trends in modern aesthetic medicine. *Chin Med J.* 2020;133(6):741-742. doi:10.1097/CM9.0000000000000679.
10. Gałęba A, Marcinkowski JT. Aesthetic medicine— a separate field of medicine, as a combination of many medical specialties. *OJN.* 2015;5(2):158-162. doi:10.4236/ojn.2015.52019.
11. Gupta AK, Polla Ravi S, Wang T, Talukder M, Starace M, Piraccini BM. Systematic review of mesotherapy: a novel avenue for the treatment of hair loss. *J Dermatolog Treat.* 2023;34(1):2245084. doi:10.1080/09546634.2023.2245084.
12. Haney B. Psychological aspects of aesthetics. In: *Aesthetic Procedures: Nurse Practitioner's Guide to Cosmetic Dermatology.* Cham: Springer; 2024. doi:10.1007/978-3-030-19948-7_4.
13. Kassir M, Gupta M, Galadari H, Kroumpouzou G, Katsambas A, Lotti T. Complications of botulinum toxin and fillers: a narrative review. *J Cosmet Dermatol.* 2020;19(3):570-573. doi:10.1111/jocd.13266.
14. King M. Management of Tyndall effect. *J Clin Aesthet Dermatol.* 2016;9(11):E6-E8. PMID:28210392.
15. Kononowicz WS, Malara B. Post-treatment physiological effects, adverse effects and complications after the selected aesthetic treatments: review of the literature. *Aesth Cosmetol Med.* 2021;10(5):211-216. doi:10.52336/acm.2021.10.5.01.
16. Kroumpouzou G, Kassir M, Gupta M, Patil A, Goldust M. Complications of botulinum toxin A: an update review. *J Cosmet Dermatol.* 2021;20(6):1585-1590. doi:10.1111/jocd.14160.
17. Lee KC, Pascal AB, Halepas S, Koch A. What are the most commonly reported complications with cosmetic botulinum toxin type A treatments? *J Oral Maxillofac Surg.* 2020;78(7):1190.e1-1190.e9. doi:10.1016/j.joms.2020.02.016.
18. Matthews-Kozanecka M, Baum E, Mojs E. Polemics around facial aesthetic medicine. *J Face Aesth.* 2023;5(2):94-102. doi:10.20883/jofa.60.
19. Minokadeh A, Jones DH. Are you up-to-date on dermal fillers? *Cutis.* 2020;106(2):59-60. doi:10.12788/cutis.0030.
20. Rayess HM, Svider PF, Hanba C, Patel VS, DeJoseph LM, Carron M, et al. A cross-sectional analysis of adverse events and litigation for injectable fillers. *JAMA Facial Plast Surg.* 2018;20(3):207-214. doi:10.1001/jamafacial.2017.1888.
21. Rummaneeethorn P, Chalermchai T. A comparative study between intradermal botulinum toxin A and fractional microneedle radiofrequency for the treatment of primary axillary hyperhidrosis. *Lasers Med Sci.* 2020;35(5):1179-1184. doi:10.1007/s10103-020-02958-8.
22. Sethi N, Singh S, DeBouille K, Rahman E. A review of complications due to the use of botulinum toxin A for cosmetic indications. *Aesth Plast Surg.* 2021;45(3):1210-1220. doi:10.1007/s00266-020-01983-w.
23. Snozzi P, Van Loghem JAJ. Complication management following rejuvenation procedures with hyaluronic acid fillers—an algorithm-based approach. *Plast Reconstr Surg Glob Open.* 2018;6(12):e2061. doi:10.1097/GOX.0000000000002061.
24. Stack ER, Spongberg C, Braud SC, Stanton WN, Elway M. Clinical advances in exosome-based therapies for aesthetic medicine: a systematic review and meta-analysis of human clinical trials. *Aesthet Surg J.* 2026;46(Suppl 1):S13-S25. doi:10.1093/asj/sjaf178.
25. Sugrue CM, Kelly JL, McInerney N. Botulinum toxin treatment for mild to moderate platysma bands: a systematic review of efficacy, safety, and injection technique. *Aesthet Surg J.* 2019;39(2):201-206. doi:10.1093/asj/sjy179.
26. Szwed W, Nowak A, Bogusz K, Baran N, Maksymowicz M, Bielak A, et al. Side effects of mesotherapy - review. *J Educ Health Sport.* 2023;27(1):125-139. doi:10.12775/JEHS.2023.27.01.011.