COMMENTARY

# Pipeline of Devices and Aesthetics: What Is Left?

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Aesthetic dermatology is experiencing a continued shift toward minimally invasive procedures with the least amount of patient downtime. Herein we focus on the advancements and evolving technologies in the development for neurotoxins, fillers, exosomes, microneedling, and microcoring devices that are currently available or in development. These treatment advancements offer dermatologists a broader range of tools, enabling more patients to pursue cosmetic treatments with greater comfort and individualized care. **KEYWORDS:** Aesthetic dermatology, minimally invasive procedures, botulinum toxin, soft tissue fillers, exosomes, microneedling, micro-coring, neurotoxins

Modern aesthetic care emphasizes treatments that are highly effective, minimally invasive, and require minimal downtime.[1] The global medical aesthetics market was valued at $15.59 billion in 2023 and is forecasted to balloon to $35.32 billion by 2030.[2] Cosmetic dermatology procedures, including energy-based devices, neurotoxins, and dermal fillers, are increasingly used to improve patient aesthetic desires. Newer, noninvasive treatment options with improved delivery methods or formulations make existing procedures increasingly appealing.[3] Recent advancements in neurotoxins, fillers, exosomes, microneedling, and microcoring devices have allowed for the creation of niche products that serve specific audiences while also opening procedures to a wider pool of patients.

## NEUROTOXINS

Onabotulinumtoxin (BoNT), produced by *Clostridium botulinum*, has many dermatologic applications, including hyperhidrosis and aesthetics (eg, rhytides), since its initial approval by the United States (US) Food and Drug Administration (FDA) in 2002. BoNT type A (BoNT-A) preparations are the most widely used version of BoNT. Currently, BoNT-A is the most performed nonsurgical aesthetic procedure globally.[4] Newer formulations have focused on different delivery mechanisms, improved formulations, and decreased immunogenicity.[4]

**BoNT-A alternatives.** Since its introduction in 2002, alternatives to Botox (Allergan Inc.) have entered the market, including Dysport (Ipsen Limited), Xeomin (Merz Pharmaceuticals) and PurTox (Mentor Corporation), all with similar mechanisms of action.[5] Ongoing developments have produced new formulations of BoNT, such as ATGC-100, developed in partnership between Eubiologics and ATGC Co., two Korean pharmaceutical companies seeking regulatory approval in the US and Europe. ATGC-100 is composed of botulinum toxin A and is currently in clinical trials. ATGC Co. has signed a partnership license and supply agreement for entry into Europe and the United Kingdom.[6,7]

Newer neurotoxins offer additional benefits beyond their predecessors: ready-to-use formulations that eliminate the need for reconstitution, engineered serotypes designed for various speeds of onset and durations of effect, and topical delivery systems that broaden applications.

**Ready-to-use formulations.** BoNT products available on the market require reconstitution with saline prior to administration, leading to potential reconstitution-related dosing errors and contamination.[8] Ready-to-use formulations in development are seeking to address these issues. From a clinical perspective, while cosmetic outcomes may be similar, the incorporation of ready-to-use BoNT can improve practice efficiency, especially in clinics with high patient throughput.

RelabotulinumtoxinA (Relfydess; Galderma) is a ready-to-use liquid BoNT-A formulation that uses "precipitation-free extraction and activity-preserving refined liquid" technology to preserve molecular integrity. RelabotulinumtoxinA is also manufactured with a pure toxin formulation that decreases long-term immunogenic risk, a potential inhibitor of long-term therapeutic efficacy, due to a decreased protein load.[8] In 2022, the phase 3 READY-1 and READY-2 trials demonstrated significant improvement in

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both frown lines and crow's feet, with effects lasting up to 6 months.[8,9] In early 2025, Galderma announced the approval of relabotulinumtoxinA in several markets, such as Europe and Australia, while it is currently awaiting US approval.[10]

AI-09 (Eirion Therapeutics) is another ready-to-use liquid BoNT that eliminates the need for reconstitution with saline and is stable at room temperature for at least 3 months.[11] Phase 1 and 2 clinical trials demonstrated a median duration of response for the highest dose tested of 26 weeks, or 6 months.[12] An Investigational New Drug (IND) application was submitted in late 2025 and a phase 2 randomized trial was completed in February 2026.

**Rapid onset, short-acting.** BoNT injections typically provide results for 3 to 6 months.[14] While the duration of effect may be desirable to some patients, others may seek short-acting options. The development of short-acting BoNT may provide benefit to patients who are reluctant to commit to longer-term effects or for those who desire treatment prior to a 1-time event. Current products may require up to 14 days to take full effect.[15] Agents with a faster onset offer the advantage of more immediate results.

TrenibotulinumtoxinE (BoNT/E; TrenibotE; AbbVie) is a novel botulinum neurotoxin serotype E with a rapid onset, short-acting effect. Patients observe effects as early as 8 hours postinjection and experience a shorter duration of effect, lasting 2 to 3 weeks. BoNT/E is indicated for the treatment of glabellar lines and was found to have similar rates of adverse events when compared to placebo or repeated treatments.[16] BoNT/E has completed multiple phase 3 trials and in April 2025, AbbVie submitted an FDA biologics license application.[17]

**Long-acting.** There is also a demand from patients and providers for longer-lasting neurotoxins. DaxibotulinumtoxinA (Daxxify; Revance Therapeutics) was the first long-lasting BoNT formulation, with a median duration of effect of 6 months and results lasting as long as 9 months in some patients.[17] Other BoNTs are following suit, with the goal of decreasing frequency of administration and decreasing periods of suboptimal effect.

IPN-10200 (Ipsen) is a longer-acting neurotoxin currently in phase 1/2 trials. IPN-10200 is being studied for both aesthetic uses and medical uses (ie, treatment of cervical dystonia). Clinical trials are assessing the safety and efficacy of increasing doses for treating moderate to severe upper facial lines.[19]

**Topicals.** Current BoNTs on the market are injectables, which require a hypodermic needle for administration. Injectables carry risks of potential pain, bleeding, and bruising, which can increase patient downtime.[19] Potential needle misplacement can also lead to off-target adverse effects such as ptosis, and injectables can pose a problem for patients who are averse to needles. Topical BoNTs in development have the potential to remedy these issues. Reduced invasiveness in neurotoxin procedures leads to decreased pain, bleeding, and bruising, along with minimized downtime and a lower risk of adverse effects.[20] Transdermal medications are an effective mode of drug delivery widely used across different specialties. Estradiol, fentanyl, and nicotine are examples of medications available as transdermal patches.[21] Advancements in topical BoNT delivery are an example of how the transdermal mode of delivery can be applied to neurotoxins to reach a greater patient population.

ET-01 (Eirion Therapeutics) is a topical formulation of BoNT-A applied in a clinical office using a proprietary process nanoemulsion technology encapsulating BoNT in oil for enhanced transdermal delivery of large molecules, such as BoNT. Clinical trials demonstrated peak effect at Week 4, and effects were observed for 26 weeks. ET-01 has also undergone multiple phase 2 trials for both lateral canthal lines and axillary hyperhidrosis.[20,22]

DMT410 (Dermata Therapeutics) is another topical BoNT indicated for the treatment of primary axillary hyperhidrosis. The powder, derived from sea sponges (*Spongilla lacustris*), creates channels through the stratum corneum via needle-like spicules. DMT410 provides the advantage of allowing for more limited administration and lower systemic absorption. At Day 29 in the phase 1 DMT410 hyperhidrosis trial, 80% of patients achieved an overall decrease in gravimetric sweat production of >50%. DMT410 has also undergone phase 1 proof-of-concept studies for facial aesthetics.[23–25]

## SOFT TISSUE FILLERS

Soft tissue fillers are widely used as a noninvasive procedure to correct age-related soft tissue defects, reduce wrinkles and fine lines, and treat photodamage. Fillers last 6 months on average and are fully reversible due to their biodegradability.[26] Currently available products vary in their method of molecule modification and stabilization.[26] New formulations of fillers seek to change active molecules and decrease pain during injection.

Collagen fillers are an ideal option for treating collagen deficiency in patients; these products were historically considered the "gold standard" due to their intrinsic structural properties before being overtaken by other resorbable fillers, such as hyaluronic acid (HA). In the last two decades, collagen fillers have experienced a resurgence due to advances in purification processes to minimize immunogenicity and infection risks.[27] A novel cross-linked collagen dermal filler with lidocaine was developed by Sunmax Biotechnology and approved by the Taiwanese FDA in 2014 with the goal of increasing stability and decreasing pain with administration.[28] The injectable demonstrated better efficacy for correcting nasolabial fold wrinkles at the primary efficacy endpoint and follow-up periods.

Eluminex Biosciences has a pipeline of innovative products, EB-201 to EB-204, that use different molecules to increase the stability and efficacy of injectables. EB-201, the first full-length triple-helix recombinant human type III collagen (rhCIII) with 0.3% lidocaine, is designed to replace type III collagen lost from aging and sun exposure. Having completed preclinical studies, EB-201 is currently under development, with first market entry anticipated for China in 2026. EB-202 is the first full-length, triple-helix rhCIII with enhanced cross-linking to extend aesthetic rejuvenation durability. Early research and development work on EB-202 has been completed. Subsequently, EB-203 would be the first blend of full-length, triple-helix recombinant human type I (rhCI) and rhCIII designed to replace type I and type III collagen that is naturally lost to aging. Finally, EB-204 has been marketed as the first blend of full-length triple-helix rhCIII and HA to augment both collagen replacement and HA performance.[29]

## POSTBURN SKIN REGENERATION

Scarring following burn injury can impact quality of life through appearance, pain, pruritus, and potential loss of function.[29] Burn injuries typically result in inflexible, collagen-rich scars due to the lack of elastin fiber formation. Recombinant tropoelastin (TE) injection has been explored as a method of enabling elastic fiber production in burn scars to improve skin flexibility. TE, the soluble precursor of insoluble elastin, is not readily produced in adults. Results demonstrated the formation of new elastin fibers. While skin

flexibility was not improved, the ability to restore elastin fiber production in adult skin is promising for skin regeneration.[30]

## EXOSOMES

Exosomes are extracellular vesicles that play a role in intercellular transportation. While historically viewed as a cellular waste product, their role in several biological processes makes exosomes promising diagnostic and therapeutic targets for skin conditions.[31] As a therapy, exosomes may help regulate inflammation, fibrosis, and tissue regeneration due to their role in regulating the skin microenvironment.[32] They support skin homeostasis through intercellular communication and play an important role in the transport of bioactive molecules. Such molecules include lipids (eg, cholesterol, sphingolipids, and phospholipids), proteins, and nucleic acids. They can also facilitate epidermal barrier maintenance, regulate keratinocyte proliferation, modulate immune responses to inflammatory skin conditions, regulate melanin in the context of pigmentation disorders, and promote wound healing.[33] Exosomes have been shown to be a promising candidate in treating several dermatologic conditions, including acne vulgaris, psoriasis, allergic contact dermatitis, and atopic dermatitis.[34]

Exosomes derived from stem cells have shown promise in treating wounds and scars while revitalizing aging skin. Stem cell–derived exosomes offer advantages such as nonimmunogenicity, noninfusion toxicity, easy access, and nontumorigenic potential.[35] These characteristics make exosomes a potential novel therapeutic option for aesthetic treatment of conditions such as alopecia, scarring, hyperpigmentation, and facial rejuvenation.[36] Currently, there are no FDA-approved exosome products available to consumers, and therapies are largely unregulated.[37] However, therapeutic approaches are in development to leverage the considerable promise of exosome technology.

Exo-7A-SC (Exolitus) is a stem cell–derived drug candidate with antiscar properties. This promising exosome therapy is morphogenic, anti-inflammatory, antifibrotic, and pro-angiogenic, and it has extracellular matrix-controlling, stem cell–stimulating, and mitochondrial activity–supporting properties. It is currently in the preclinical stage.[38]

## MICRONEEDLING AND MICROCORING

Microneedling is a minimally invasive dermatology procedure that uses fine needles to create micro-injuries in the skin. Used since the 1990s, microneedling triggers the production of collagen and elastin. Its indications include acne scars and stretch marks.[39] In addition to its ability to rejuvenate skin, microneedling can be used to enhance transdermal drug delivery. By temporarily opening channels in the skin, topical agents have better penetration. This technique can be used to deliver nanoparticles and various macromolecules.[40] Microneedling has gone through several advancements over time, and devices such as Morpheus8 (InMode Ltd.) integrate technologies such as radiofrequency (RF).[40,41] RF microneedling combines traditional microneedling with RF energy, in which the delivery of heat stimulates the production of collagen and improves skin tightness and texture.[39]

Applications of microneedling in transdermal drug delivery have led to the emergence of dissolvable microneedle arrays (MNAs). Composed of polymers, including chitosan, HA, and synthetic polymeric materials, dissolvable MNAs can achieve instant, sustained, delayed, or targeted release of the drug.[42] A typical patch of MNAs is compromised of tens to hundreds of needles with 1 to 20 µm tips. Dissolvable MNAs offer the advantages of reduced pain, minimal invasiveness, and high efficiency. Modulation of the penetration depth of dissolvable MNAs, coupled with imaging techniques that can provide micron-level resolution, can potentially provide a novel drug delivery system.[42]

Microcoring is a novel, minimally invasive technology similar to microneedling, but hollow needles remove full-thickness skin cores. Similar in principle to punch biopsies, microcoring can remove 5% to 8% of skin's surface area. Due to the small area, the removal of the cores causes regenerative healing rather than scarring.[43] Microcoring has demonstrated promising outcomes in promoting skin tightening and quality without the use of heat.[44] Ellacor (Cytrellis) is approved by the FDA for moderate and severe wrinkles in the mid- and lower face in adults aged 22 years or older with Fitzpatrick skin types I to IV.[45]

Similar microcoring devices emerging include AI.ME device (Venus Concepts Inc.) and N-Derm device (N-finders, Co., Ltd).[46,47] Venus Concepts Inc. received clearance from the FDA for marketing AI.ME as a robotic technology for fractional skin resurfacing. The robotic system uses machine vision and artificial intelligence algorithms to target the dermis in a strategic manner. Using microcoring, it removes up to 10% of skin.[46] The N-Derm platform uses 1-mm diameter rotating scalpels to resect scars. In a trial of acne scar treatment, it demonstrated improvement in scar appearance, and the treatment was well tolerated with minimal pain and bleeding.[47,48] The development of technologies in the field of microcoring suggest its continued growth as a tool for skin resurfacing in the realm of dermatology.

## FUTURE HORIZONS

Recent innovations in aesthetic dermatology have focused on the refinement of proven treatments. Developments continue to prioritize minimal downtime for patients and reducing the invasiveness of procedures. Advancements in neurotoxins, fillers, exosomes, microneedling, and microcoring technology continue to broaden the therapeutic arsenal at the disposal of dermatologists, particularly in a cosmetic market that increasingly values less invasive options with meaningful results. Continued innovations in the field will increase effectiveness and improve safety while appealing to a broader population of patients.[49]

Looking ahead, the rapid growth of technologies, such as artificial intelligence, augmented reality, and high-resolution imaging, may pioneer further advances in cosmetic dermatology. Tools and treatments may integrate these technologies to analyze skin conditions, simulate before-and-after images, and offer personalized treatments plans. One notable development is the growing use of high-frequency ultrasonography, which enables physicians to assess skin structure, guide administration of injections, and monitor treatment efficacy.[50] Likewise, the growth of robotic assistance may streamline procedures and allow for more precise results, as seen in microcoring and advances in hair restoration.[51,52] As innovations mature, the field of cosmetic dermatology will continue to optimize pre-existing treatments and technologies, ultimately redefining both the standard of care and patient outcomes.

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