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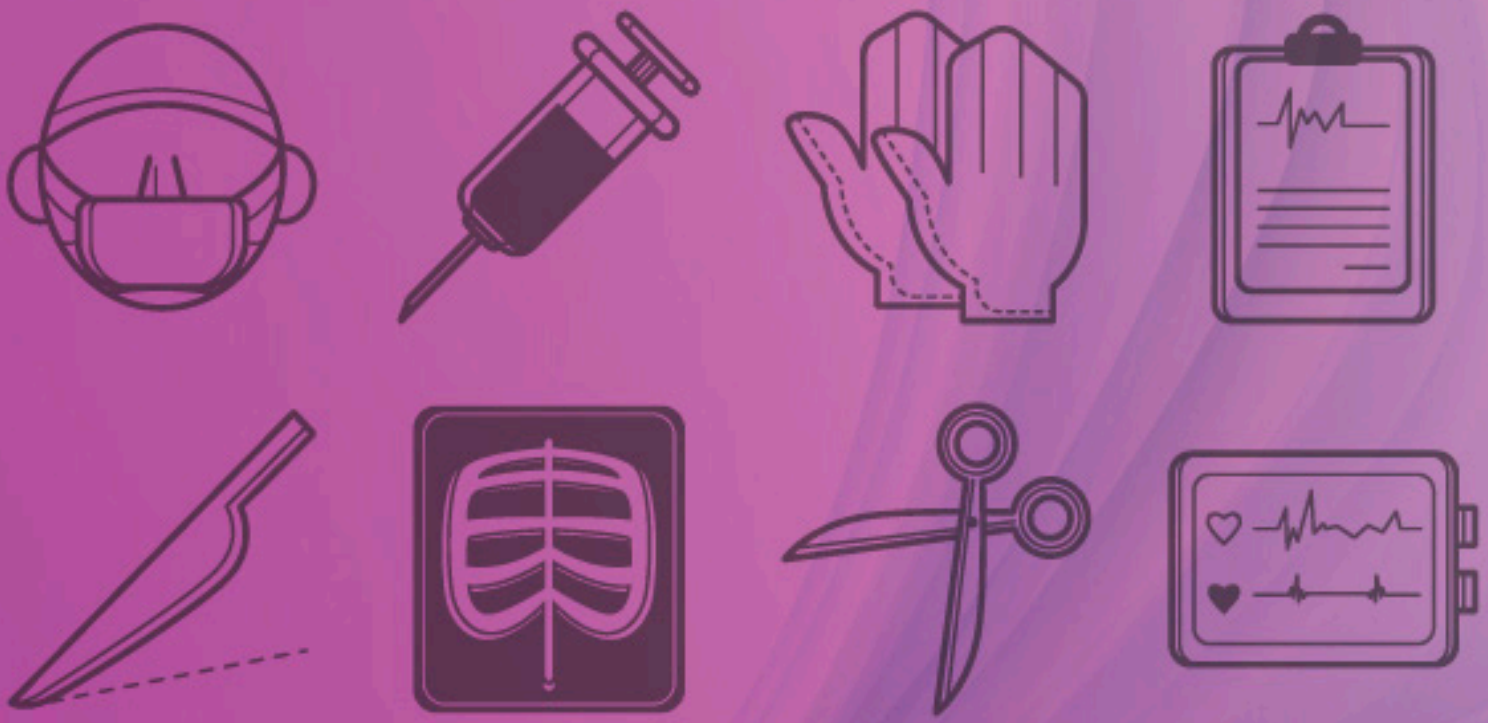

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Combination of Energy-Based Devices with Biostimulator Therapies in the Aesthetics Dermatology: Scoping of the Review

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ABSTRACT

The rising demand for nonsurgical aesthetic procedures has bumped up the widespread use of energy-based devices and biostimulatory therapies for skin rejuvenation. Even though both options can work fine on their own, more and more clinicians are pairing them up to deal with the multifactorial nature of skin aging, like laxity, wrinkles, volume reduction, pigment shifts, and those textural irregularities that just don't seem to go away. Still, how much and how consistently the evidence really backs combination therapy over monotherapy is kind of not fully clear. This scoping review looked at clinical efficacy, safety, and how durable the results were, plus the overall study methods quality for work that compared combination therapy (biostimulators plus energy-based devices) against the same kind of monotherapy. We did a thorough search in Ovid MEDLINE and Embase, covering studies from January 2015 through May 2025. The review was done in line with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA-ScR) guidelines. In the end, 12 studies with 806 participants fit the inclusion criteria. Across those studies, combo therapy seemed to show better clinical outcomes than monotherapy again and again. The included reports described meaningful gains in skin laxity, collagen stimulation, wrinkle improvement, pigmentation, acne scarring, and patient satisfaction. And, importantly, these stronger outcomes were reached without a noticeable rise in serious adverse events, so the safety profile looked favorable. Taken together, the findings point toward the idea that combining biostimulators with energy-based devices can deliver sort of synergistic advantages and may produce better aesthetic results than single-modality treatments.

INTRODUCTION

Over the past two decades, aesthetic medicine has sort of drifted from isolated corrective interventions to more multimodal approaches that try to deal with the complicated biological stuff beneath skin aging (Tanwar *et al.*, 2026). Cutaneous aging is not just one thing happening at a time; it involves progressive shifts in the epidermis, dermis, extracellular matrix, vascular network, and the supporting structures. The end result shows up as wrinkles, skin laxity, volume reduction, and texture changes (Demir *et al.*, 2024). So in today's practice, clinicians are more and more focused on procedures that target multiple aging mechanisms at once, not just one visible sign. And because patients want faster, minimally invasive options , the use of energy-based devices and biostimulatory therapies has also ramped up. If you look at global aesthetic surgery statistics, non-surgical facial rejuvenation seems to have grown a lot, and injectables plus energy-based technologies are among the top performed categories (Demir *et al.*, 2024). This pattern likely comes from patient preference for interventions that are effective, have less downtime, and also feel safer (Kiyat & Akyüz, 2026). Energy-based devices , like lasers, radiofrequency systems, micro-focused ultrasound, high-intensity focused ultrasound, intense pulsed light, and radiofrequency micro-needling, tend to remodel tissue via controlled thermal or photonic stimulation (Fisher *et al.*, 2024). Basically these tools drive collagen remodeling, help activate fibroblasts, support elastin regeneration, and influence vascular structures, which together can improve skin texture, firmness, and laxity. Still, even though they can tighten and rejuvenate pretty well, they usually do not fully restore volume or provide long-term structural support in the same way a volumizing approach would (Kiyat & Akyüz, 2026).

Biostimulators, on the other hand, are another key advancement in regenerative aesthetics. Examples include calcium hydroxyapatite, polylactic acid, hyaluronic acid-based formulations, and autologous platelet-derived products (Smith *et al.*, 2025). These agents work by encouraging the body's own collagen formation and extracellular matrix remodeling. Unlike conventional fillers that mainly do immediate volume replacement, biostimulators promote slower, more sustained tissue regeneration, which can lead to better skin quality and stronger structural integrity over time (Lee *et al.*, 2025). Even so, when used alone, they might not handle surface irregularities, photodamage, or quite marked skin laxity as well. That said, the reason people combine energy-based devices with biostimulatory therapies is pretty intuitive (Shi *et al.*, 2025). The energy-based treatments help create a regenerative tissue setting by boosting cellular turnover, increasing vascular permeability, and encouraging fibroblast recruitment. After that,

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adding biostimulators may enhance collagen synthesis and extracellular matrix remodeling, potentially giving more impressive and longer-lasting outcomes (Shi *et al.*, 2025). This kind of synergy is part of why combination strategies are getting used more in aesthetic dermatology. But even with wide clinical adoption, the evidence on the effectiveness and safety of these combination approaches is still a bit scattered. Studies often differ in design, treatment schedules, sequencing strategies, and even which outcomes they measure (Haddad *et al.*, 2022; Tam *et al.*, 2025). Because of that, it is hard to compare results directly, and it becomes difficult to build standardized treatment recommendations. So, it makes sense that a comprehensive synthesis of the literature is needed to judge the current evidence and also clarify where the real gaps still are. So, this scoping review is set up to compare the clinical efficacy of combination therapy that involves biostimulators plus energy-based devices against equivalent monotherapy approaches. It will also look at differences in safety, how durable the outcomes are, and how strong the methodology is across published studies.

Objectives

1. To compare the clinical efficacy of combination therapy with biostimulators and energy-based devices with an equivalent method of monotherapy treatment.
2. To compare the safety profile, outcome longevity, and methodological weakness of combination therapies with monotherapy.

LITERATURE REVIEW

The growing adoption of combination, aesthetic therapies seems to show up in both the big-picture procedural patterns and the newer clinical evidence that keeps coming in. In fact, if you look at international aesthetic surgery statistics, non-surgical procedures make up most of the aesthetic interventions worldwide, and injectables along with energy-based devices are the categories that appear to be expanding the fastest (Triana *et al.*, 2024). Some studies have also described outcomes that look better with combination approaches instead of just using one method. For example, fractional carbon dioxide laser used together with poly-L-lactic acid, or platelet-rich plasma (PRP), has shown larger improvements in acne scars , wrinkle reduction, dermal thickness, and even patient satisfaction than laser treatment alone. In a similar vein, microneedling radiofrequency, when combined with poly-L-lactic acid, seems to deliver stronger results for facial laxity and wrinkle severity, which hints at a kind of synergistic effect on collagen remodeling (Corduff *et al.*, 2021; Corduff *et al.*, 2025; Lu & Lee, 2023). Other work has looked at calcium hydroxyapatite alongside energy-based devices, like micro-focused ultrasound and radiofrequency technologies. Those studies reported better skin firmness, elasticity and tissue tightening, compared with single-modality strategies. PRP, meanwhile has been explored a lot as a support add-on to laser therapies, showing improvements in skin elasticity, pigmentation, healing speed, and generally higher satisfaction ratings (Corduff & Goldie, 2025; G. Faria *et al.*, 2023).

In addition, Faria and Galal found that erythema was resolved faster and that downtime was lower in the combination side, indicating that platelet-derived growth factors pose a possibility of accelerating post-laser healing. In a different study, Ibrahim *et al.* explored the use of laser-assisted topical poly-L-lactic acid delivery to upper lip rhytides and found that topical delivery in combination with any therapy did not raise the incidence of side effects and that it generated significant changes in wrinkle depth and skin texture (G. Faria *et al.*, 2023). Juhasz *et al.* investigated the outcome of the adjunction of microneedling radiofrequency with poly-L-lactic acid in a split-face prospective study. They recorded that the combination side showed much better improvement, both in facial laxity and wrinkle severity, than radiofrequency, using the physician-rated scales as well as ultrasound measurements of dermal thickness (Juhász *et al.*, 2023). The authors have concluded that thermal stimulation and collagen induction had a synergistic remodelling effect and not an additive one (Juhász *et al.*, 2023). The second article by Casabona and Marchese discussed the application of calcium hydroxylapatite with microneedling and topical ascorbic acid to treat stretch marks. Their clinical results showed a better texture and elasticity of the skin, confirming the need to see the biostimulator-device combinations as useful beyond the face rejuvenation sphere (Casabona, 2022).

A combination of ultrasound-based equipment with biostimulators has been extensively researched, especially in skin laxity. Casabona *et al.* performed a histological study in the evaluation of the combination of micro-focused ultrasound with visualization and calcium hydroxylapatite injections (Casabona & Pereira, 2017). El Faria *et al.* have shown that the use of botulinum toxin together with calcium hydroxylapatite to treat cervical rejuvenation was more effective in enhancing firmness and contour without raising the risks of complications (G. E. Faria *et al.*, 2023). But some authors, such as Fisher *et al* and Ibraham O *et al* also noted that the differences in outcome measures and the period of follow-up limit the cross-study comparison (Ibrahim *et al.*, 2019; Shi *et al.*, 2025). Broadly, the literature has shown that authors in different regions and research designs have found better or more lasting results when energy-based equipment is utilized in conjunction with biostimulatory therapies as opposed to monotherapies (Chahine *et al.*, 2025).

There is also more evidence suggesting calcium hydroxyapatite combined with botulinum toxin and ultrasound-based technologies for facial contouring, cervical rejuvenation, and managing skin laxity. Still, even though the overall direction across studies tends to lean toward combination therapy over monotherapy, there's noticeable variability between protocols, outcome measures, and follow-up timeframes. So , even though researchers sometimes want to compare results directly, it's not always straightforward, and that makes

comprehensive evidence synthesis kind of necessary, if clinical practice and future research are going to be properly guided.

MATERIALS AND METHODS

A scoping review was done, kind of like according to the Preferred Reporting Items for Systematic Reviews and Meta Analyses Extension for Scoping Reviews (PRISMA ScR) guidelines, to map the evidence that exists on how biostimulators and energy based devices are used together in aesthetic medicine (Page *et al.*, 2021). We looked at adult participants, 18 years and older, who were having non surgical aesthetic procedures, mainly for facial aging, skin laxity, acne scarring, pigmentation problems, and similar concerns. In other words, combination therapies that used both biostimulators and an energy based device were compared with similar monotherapy options. For the literature hunt, we searched Ovid MEDLINE and Embase, for papers published from January 2015 to May 2025. The search strings included different keyword groupings around biostimulators (like platelet rich plasma, poly L lactic acid, calcium hydroxylapatite, hyaluronic acid), plus energy based devices (such as laser, radiofrequency, microneedling radiofrequency, high intensity focused ultrasound, microfocused ultrasound). Clinical outcomes were also part of the query, tied to skin rejuvenation, and general aesthetic improvement.

Once we got all the citations, they were imported into EndNote X7 for duplicate removal and for screening. Titles and abstracts were screened at first, then full text was reviewed based on predefined eligibility rules. To be included, a study had to involve adults, use a combo of biostimulators and energy based devices, have some sort of comparison group, report clinical outcomes that were relevant, be written in English, and include at least eight participants. Exclusions were for reviews, editorials, animal work, surgical interventions, and also studies where there was no original clinical data, or nothing measurable like that. The search turned up 521 records. After removing 45 duplicates, we screened titles and abstracts, then assessed 93 full text articles for eligibility. Ultimately, twelve studies m*et a*ll inclusion criteria and made it into the final synthesis.

What we pulled from the studies included study design, participant characteristics, intervention details, outcome measures, adverse events, and the follow up duration. The primary outcomes focused on facial rejuvenation, wrinkle reduction, skin tightening, collagen induction, pigmentation improvement, and outcomes assessed by physicians. Secondary outcomes covered things like patient satisfaction, how long the improvement lasted, safety, adverse events, and how tolerable the treatments were overall. For synthesis, we used descriptive and thematic analysis. The studies were grouped by biostimulator type, energy based device, treatment indication, and study design, sort of by those variables. Because interventions and outcomes were quite heterogeneous, the results were summarized narratively, and also shown in tabular form.

RESULT AND DISCUSSION

The database search turned up 521 records, with 430 coming from Ovid MEDLINE and 91 from Embase. After I removed 45 duplicate records using EndNote X7, 476 unique articles were left for title and abstract screening.

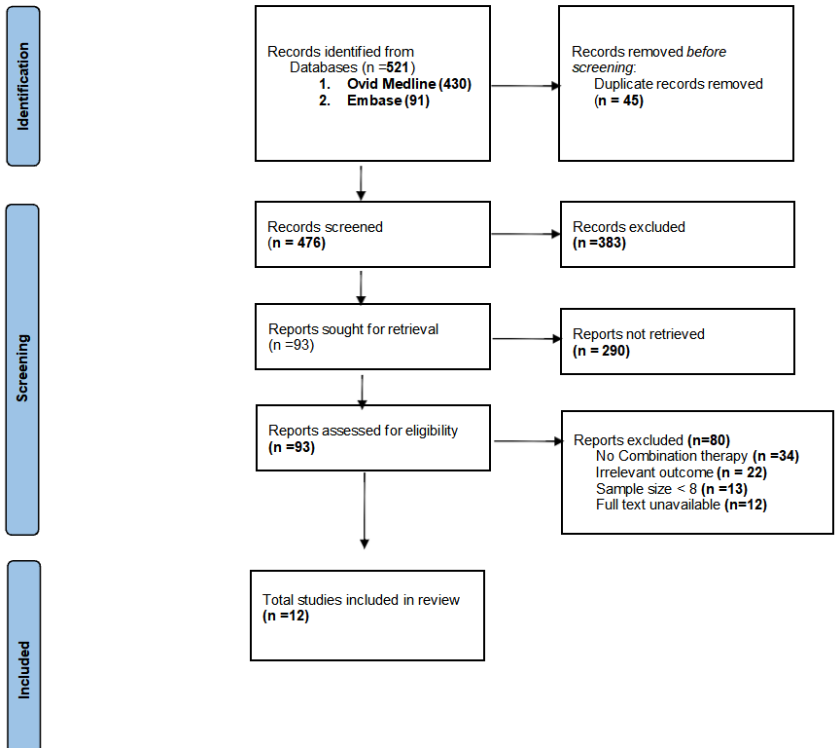

Figure 1: PRISMA 2020 Flow Diagram for the Scoping Review

From those , 383 records were excluded because of non-English publication, no available full text, mismatch with aesthetic medicine, no combination therapy involving biostimulators and energy-based devices, missing clinical outcomes that mattered, or because they were animal study designs. In total, 93 articles went through a full-text review. After eligibility was checked, 81 studies were excluded mainly due to lack of combination therapy (n = 34), irrelevant clinical outcomes (n = 21), sample sizes under eight participants (n = 13), or still no available full text (n = 13). So in the end, 12 studies fit all the predefined inclusion criteria and were taken forward for the final scoping review. The whole study selection process is shown in the PRISMA-ScR flow diagram (Figure 1).. The flow of identification, screening, eligibility assessment, and inclusion of studies is depicted in a PRISMA-ScR flow diagram (Figure 1).

Thematic Synthesis of Included Studies

A total of 12 clinical studies that were published between 2018 and 2025 were identified to be included in the scoping study. These studies were conducted across the world, including China, South Korea, India, Italy, Iran, and Egypt, marking the global use of combined aesthetic procedures. These studies cumulatively enrolled 806 participants in total, with the subjects mainly including adults. The ages of the participants varied from the 18 years to mid-50s, with the mean age estimated to be around the mid 30s. This gets well established as the age-group that gets impacted by early to moderate changes of cutaneous ageing (Ahlawat *et al.*, 2023; Benar & Benar, 2024; Cai *et al.*, 2020; Casabona *et al.*, 2023; Casabona & Nogueira Teixeira, 2018; Galal *et al.*, 2019; Li *et al.*, 2025; Lu *et al.*, 2025; Nilforoushzadeh *et al.*, 2021; Qi *et al.*, 2025; Ramirez & Puah, 2021; Wu *et al.*, 2024).

Out of the 12 studies, the widely used biostimulators were platelet-rich plasma (PRP), Poly-L-lactic acid (PLLA) (Ahlawat *et al.*, 2023; Benar & Benar, 2024; Li *et al.*, 2025; Lu *et al.*, 2025; Qi *et al.*, 2025). Other biostimulatory agents were calcium hydroxylapatite (CaHA) (Casabona & Nogueira Teixeira, 2018). Energy-based devices included radiofrequency (RF), Fractional CO Lasers, Fractional Er:YAG Lasers/Erbium Lasers, Microneedling Radiofrequency, Microfocused Ultrasound with Visualizations (MFU-V), and Endolift 1470-nm Lasers. Despite the variations in study type, treatment protocol, and metrics of assessment, it was clear in all studies that the results of biostimulatory agent treatments in combination were always better than those in monotherapy for erythema improvement, reduction of wrinkles, and tightening of the skin (Ahlawat *et al.*, 2023; Cai *et al.*, 2020; Casabona *et al.*, 2023; Galal *et al.*, 2019; Nilforoushzadeh *et al.*, 2021; Ramirez & Puah, 2021; Wu *et al.*, 2024).

Li *et al.* conducted a prospective randomized controlled trial with 15 female patients with neck wrinkles, aged between 36 and 45 years. They compared PRP alone with PRP combined with microneedling and radiofrequency. The combination of PRP and RF caused the most significant improvement in wrinkle severity, achieving 100 percent GAIS improvement, with transient redness and swelling reported (Li *et al.*, 2025). In the study by Benar *et al.* (2024), a big prospective randomized trial involving 234 patients aged between 32 and 52 years was conducted in South Korea (Benar & Benar, 2024). PLLA performed alone was compared against PLLA combined with Endolift 1470-nm laser. Combination therapy achieved much higher patient satisfaction compared to monotherapy at 91.4 percent, with the main adverse effects being edema and bruising (Benar & Benar, 2024).

A study by Qi *et al.* (2025) claimed that their RCT among 80 patients with periorbital aging found the addition of PRP to be superior to laser alone in improving GAIS, with results of 97.5 percent vs. 82.5 percent improvement in the monotherapy group, with immediate bruising and pain (Qi *et al.*, 2025). A randomized case-control study was performed on 30 patients with post-inflammatory orbital hyperpigmentation by Lu *et al.* (2024), comparing Q-switched ruby laser monotherapy with combined therapy of Q-switched ruby laser and PRP. The result revealed persistent hyperpigmentation improvement in the combination group with mild erythema (Lu *et al.*, 2025). Casabona *et al.* conducted a retrospective study involving 47 patients treated for neck and décolletage rejuvenation using MFU-V followed by diluted CaHA, which resulted in improved scores for the neckline, with pain and bruising as mild adverse reactions. The study was published in 2018 (Casabona & Nogueira Teixeira, 2018).

A comparative interventional study conducted by Ahlawat *et al.* (2023) on 60 patients with vitiligo depicted better results of repigmentation when laser alone was associated with PRP compared to laser alone. This study established the subsidiary effects of erythema and burning sensation in the PRP group (Ahlawat *et al.*, 2023). In a split-face randomized controlled trial conducted among 30 patients with facial laxity, Wu *et al.* (2024) found a comparison of microneedling with radiofrequency alone with a combination of microneedling with radiofrequency and PLLA. The combination showed more smoothing of the wrinkles and more skin thickness on ultrasonography (Wu *et al.*, 2024).

This was a prospective case study by Casabona *et al.* (2023), where they evaluated a single patient in Italy on the histological effects of MFU in combination with CaHA and hyaluronic acid when injected on the same day versus delayed injection (Casabona *et al.*, 2023). In the split-face RCT, Galal *et al.* (2019) treated 30 patients with atrophic acne scars using the CO2 fractional laser alone versus combined with PRP. Good to excellent results were found in 70 percent of the combined group versus 30 percent in monotherapy (Galal *et al.*, 2019).

This open-label case series study recruited 12 adult females suffering from moderate skin laxity of the brachial region, desiring a non-surgical approach for treating their upper arm appearance. The study's combination therapy

approach encompassed micro-focused ultrasound with a depth setting of 4.5 mm, immediately followed by injection of a highly diluted calcium hydroxylapatite formulation 3.0 mm beneath the skin's surface. The results were measured using Cutometer, along with subjective measures like Visual Analogue Scale and Global Aesthetic Improvement Scale, demonstrating the ability of this combination therapy approach to be tolerated by patients, as well as its effectiveness for improving skin elasticity by 88 percent by the 12th week (Ramirez & Puah, 2021). A clinical trial in Iran, led by Nilforoushzadeh *et al.* in 2021, was conducted on 32 patients suffering from periorbital dark circles, where the use of Er: YAG laser alone was compared with laser + PRP, showing improved pigment reduction and elasticity in the group using both techniques together (Nilforoushzadeh *et al.*, 2021). Erbium fractional laser, together with PRP and platelet-poor plasma therapy, has been shown in a prospective study involving 158 patients to be about 90 percent effective in treating facial rejuvenation by Cai *et al.* in 2020. The study lacked a control group; hence, conclusions were limited for comparison (Cai *et al.*, 2020).

Table 1: Summary and Study Characteristics of Studies Included in This Scoping Review.

NO:	1	2	3	4
Author Year	Li 2025 (Li *et al.*, 2025)	Benar 2024 (Benar & Benar, 2024)	Qi 2025 (Qi *et al.*, 2025)	Lu 2024 (Lu *et al.*, 2025)
Study Design	Prospective RCT	Prospective RCT	RCT	Randomized case control
Sample Size Population	15 females aged 36–45 with neck wrinkles	234 patients aged 32–52	80 patients periorbital	30 patients POH
Biostimulator Used	PRP	PLLA	PRP	PRP
EBD / Device	RF Accent Pro	Endolift 1470 nm	CO_2 fractional laser	Q-switched ruby laser
Device Settings Sessions	30 kJ 80–120 W depths 1.5–2.5 mm monthly ×3	3 W 2000 J single session	5 mJ 600 Hz monthly ×3	22–24 mJ monthly ×3
Intervention Protocol	PRP vs PRP+MN vs PRP+RF	PLLA alone vs PLLA+Endolift	Laser vs Laser+PRP	QSR vs QSR+PRP
Outcome Measures	GAIS WAS CBS elastin collagen	Patient satisfaction dermatologist score	GAIS VISIA SOFT eyelid grading	VAS TTRS VISIA
Key Results	RF+PRP showed a significant WAS reduction, GAIS 100%	Higher satisfaction in combo group 91.4%	Combo GAIS 97.5% vs 82.5%	Sustained pigmentation improvement in combo
Side Effects	Redness, swelling, ecchymosis, MN hyperpigmentation	Edema, bruising, numbness, nodule	Bruising edema pain	Erythema mild pain
Limitations	Small sample, no histology	Single-center short follow-up	Small sample, short follow-up	Lifestyle confounders
Follow-up	1 6 months	4–6 months	1 -3 6 months	12 24 weeks

10	9	8	7	6	5
Ramirez 2021 (Ramirez & Puah, 2021)	Galal 2019 (Galal *et al.*, 2019)	Casabona 2023 (Casabona *et al.*, 2023)	Wu X 2024 (Wu *et al.*, 2024)	Ahlawat 2023 (Ahlawat *et al.*, 2023)	Casabona 2018 (Casabona & Nogueira Teixeira, 2018)
Prospective case series	Split-face RCT	Prospective case study	Split-face RCT	Comparative interventional	Retrospective
12 female brachial laxity	30 acne scar patients	1 patient	30 patients facial laxity	60 vitiligo patients	47 patients neck décolletage
CaHA	PRP	CaHA HA	PLLA	PRP	CaHA
MFU-V	CO_2 fractional laser	MFU Ultherapy	MFR	CO_2 fractional laser	MFU-V
4.5 mm then 3.0 mm	15 W stack2	1.5 3.0 4.5 mm	Depth 0.5 mm power 12.5 W	70–100 mJ monthly	7 MHz 3.0 mm 10 MHz 1.5 mm
MFU-V + CaHA	CO_2 vs CO_2+PRP	MFU + CaHA same vs delayed	MFR vs MFR+PLLA	CO_2 vs CO_2+PRP	MFU-V was then diluted CaHA
VAS GAIS Cutometer	Antera 3D satisfaction	Histology collagen thickness	GAIS FLR VISIA US thickness	Repigmentation MISP VAS	Merz Fabi-Bolton satisfaction
88% improvement at 12 weeks	70% good–excellent combo vs 30%	Synergistic collagen with same-day use	Greater wrinkle improvement combo	Higher MISP and VAS in the PRP group	Neckline score improved 2.6→1.3
Bruising redness	Erythema edema crusting	None significant	Crusting hematoma	Erythema burning pain	Pain bruising
Small cohort	Short follow-up	Case study	Single center	Small sample	Short follow-up
6 months	3 months	180 days	6 months	5 months	90 days

11	Nilforoushzadeh 2021 (Nilforoushzadeh *et al.*, 2021)	Prospective clinical trial	32 patients dark circles	PRP	Er:YAG laser	500–700 mJ ×3	Split-face Er:YAG vs Er:YAG+PRP	Colorimeter Cutometer VAS	Superior pigment and elasticity improvement	Erythema edema	Cost small sample	3 months
12	Cai 2020 (Cai *et al.*, 2020)	Prospective	158 patients facial aging	PRP PPP	Erbium fractional laser	300–800 mJ cm^2	Laser + PRP + PPP	Physician-patient scoring	Effectiveness ~90%	Edema erythema crusting	No control group	3months

Study Sample Size Distribution

Figure 2 shows a fair amount of variation in sample sizes across the 12 included studies, and it kind of matches the heterogeneous exploratory vibe of work on combination therapies in aesthetic dermatology. In general, the sample size went from a single patient histological case report, up to bigger prospective cohorts with as many as 234 participants. Most of the studies seemed to land somewhere in the 30 to 80 range, and they were mainly set up as randomized controlled trials, split-face formats, or prospective comparative investigations, depending on the team and the timeline. The smaller ones, though, were more often geared toward fairly specific indications, like facial and neck rejuvenation, brachial laxity, or skin tightening. Having both the larger clinical cohorts and the smaller mechanistic studies present at once really underlines the wide spread in study approaches, and how the evidence base is still in the process of becoming more settled for combined biostimulator and energy-based device therapies (Ahlawat *et al.*, 2023; Benar & Benar, 2024; Cai *et al.*, 2020; Casabona *et al.*, 2023; Casabona & Nogueira Teixeira, 2018; Galal *et al.*, 2019; Li *et al.*, 2025; Lu *et al.*, 2025; Nilforoushzadeh *et al.*, 2021; Qi *et al.*, 2025; Ramirez & Puah, 2021; Wu *et al.*, 2024)

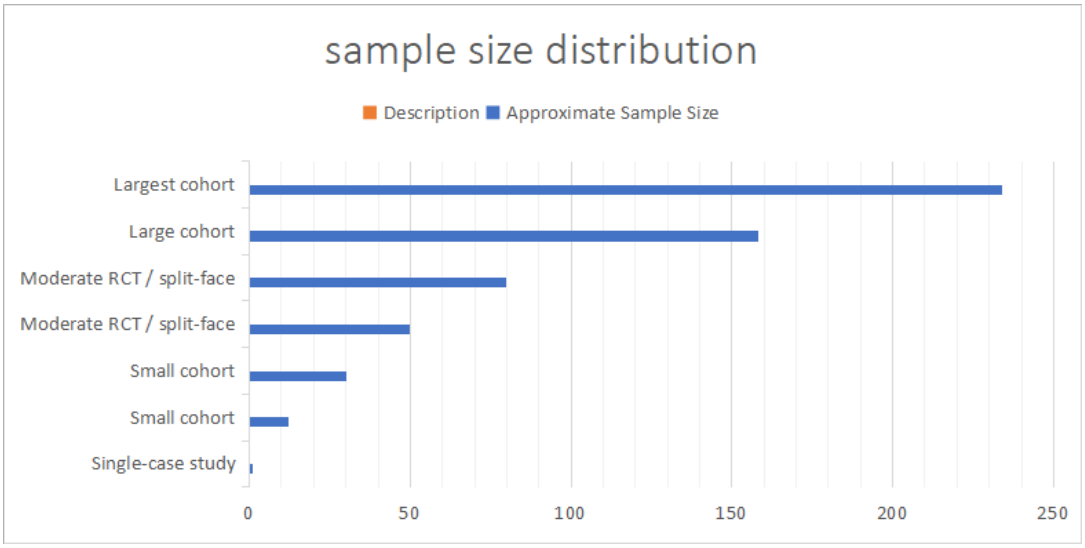

Figure 2: Bar Chart Showing Sample Size In Different Studies used In This Scoping Review.

The bar chart shows that there is an evident comparative advantage of combination therapy over monotherapy in all the assessed aesthetic outcome domains. The combination therapy was also reported to be effective in 11 studies and monotherapy only in 4 studies; this shows a significant difference in the dermal firming results. The results of the collagen stimulation also leaned towards the combination approaches, as positive results were reported in 10 studies, as compared to the 3 studies that employed the single-modality treatment. Combination therapy was found to be more effective in terms of wrinkle reduction, with a reported 9 studies, and monotherapy reported improvement of a similar degree in only 3 studies. Combination therapy had higher rates of

patient satisfaction of 85 percent or higher, as compared to monotherapy with 9 and 3 studies, respectively. On the whole, this figure helps to support the uniform tendency according to which combining biostimulators with energy-based devices can give better and more inclusive clinical results than monotherapy (Ahlawat *et al.*, 2023; Benar & Benar, 2024; Cai *et al.*, 2020; Casabona *et al.*, 2023; Casabona & Nogueira Teixeira, 2018; Galal *et al.*, 2019; Li *et al.*, 2025; Lu *et al.*, 2025; Nilforoushzadeh *et al.*, 2021; Qi *et al.*, 2025; Ramirez & Puah, 2021; Wu *et al.*, 2024).

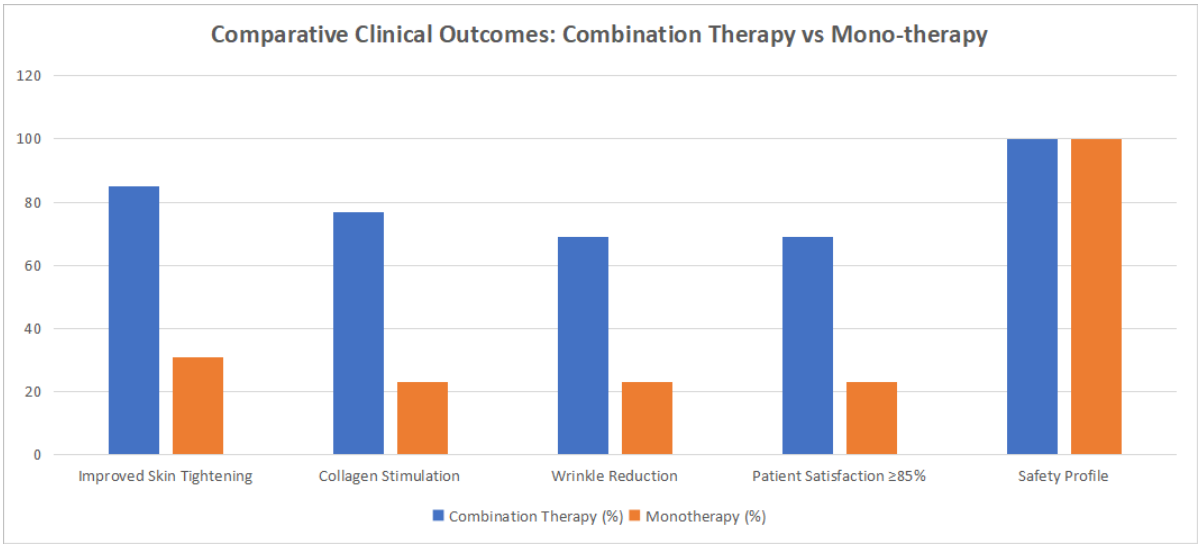

Figure 3: Comparative Clinical Outcomes: Combination Therapy vs Mono-therapy.

Discussion

This scoping review basically pulled together evidence from 12 studies looking at how biostimulators and energy-based devices were used together in aesthetic medicine. In general, combination therapy seemed to work better than monotherapy, and yeah it was especially noticeable for skin tightening, collagen stimulation, wrinkle reduction, plus patient satisfaction. Safety-wise, the combined approach stayed pretty favorable, not really raising big red flags. One of the most steady results across the included studies was improved skin tightening. The combos that involved radiofrequency, microfocused ultrasound, and laser technologies, paired with biostimulatory agents like platelet-rich plasma PRP, poly-L-lactic acid PLLA, and calcium hydroxylapatite CaHA, showed better gains in skin laxity and tissue firmness than the single-method options. It kind of implies that the quick "remodeling" push from energy-based devices gets a longer boost once biostimulators keep nudging collagen production over time. Collagen induction was also a big theme leaning toward combination therapy. Most papers noted thicker dermis, stronger collagen synthesis, or higher skin density after combined treatment. The histological and imaging results tended to support this idea of biological synergy, where the controlled thermal injury from energy-based devices makes fibroblasts more active, and also more responsive to the biostimulatory agents. And then you get more sustained tissue remodeling, not just a short burst (Casabona *et al.*, 2023; Wu *et al.*, 2024). Wrinkle reduction, acne scar improvement, and overall facial rejuvenation were similar stories. When studies looked at fractional lasers alongside PRP or PLLA, they often found stronger clinical improvement and better aesthetic scores than monotherapy did. It kind of points to the benefit of tackling different skin-aging pathways at the same time, which is what a multimodal approach is trying to do, rather than relying on a single mechanism alone (Solomon Cohen *et al.*, 2021).

Patient satisfaction was another area where the results looked consistently high. Most studies reported satisfaction above 85% . That seems tied to improvements in skin texture, tone, firmness and contour, though the exact weight of each factor can be hard to tease apart. At the same time, the combined treatments were generally well tolerated (Everts *et al.*, 2019; Nilforoushzadeh *et al.*, 2021). The adverse effects were usually mild and temporary, like erythema, edema, bruising, or short-lived discomfort. And no serious, treatment-related complications were flagged. Still, the evidence base isn't exactly uniform. There was a noticeable mix-up across the studies in terms of design, sample size, intervention protocols, outcome measures, and follow-up length, which makes direct comparisons tricky and stops a proper quantitative synthesis. Also, many studies had relatively small cohorts and shorter follow-up, so it is hard to say much about long-term efficacy or durability. Even with that limitation, the overall evidence does support the increasing use of multimodal strategies in aesthetic dermatology. The recurring pattern of better clinical outcomes, paired with a safety profile that looks acceptable, suggests combination therapy may offer more benefits than monotherapy for skin rejuvenation and related aesthetic goals (Corduff *et al.*, 2021; De Almeida *et al.*, 2019). Going forward, more well-structured

randomized controlled trials are still needed, ideally using standardized outcome measures and longer follow-up, so we can clarify optimal treatment protocols and make the evidence base sturdier.

CONCLUSION

This scoping review demonstrates that combination therapy using biostimulators and energy-based devices consistently produces superior aesthetic outcomes compared with monotherapy, particularly in skin tightening, collagen stimulation, wrinkle reduction, and patient satisfaction. The integrated approach leverages synergistic biological mechanisms to address the multifactorial nature of cutaneous aging more effectively. Importantly, combination protocols maintain favorable safety profiles when appropriately applied.

Recommendation

1. Future studies should focus on randomized controlled clinical trials with standardized outcome measurement parameters, particularly longer follow-up intervals, to assess the long-term treatment effectiveness of a combination of aesthetic therapies.
2. Individualized combination treatment strategies according to patient-specific patterns of aging and related anatomical factors should be adopted by the clinician.

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