



DOSSIER · THERAPY

Microneedling

Microneedling is a mechanical procedure, not a substance: fine needles create controlled micro-injuries in the skin, usually followed by a topical application. Accordingly, research predominantly tests it in combination. The most cited text in the field is a review on the mechanics, not a large clinical trial.

717

STUDIES IN
TOTAL

524

IN HUMANS

205

OF WHICH
CONTROLLED

6

IN ANIMALS

14

IN THE LAB

Figures from the IHR study database · Last updated 2026-10-15

How to Read This Dossier

ESTABLISHED

measured in humans, with a comparison group

PLAUSIBLE

supported by mechanism, animal studies or observation

HYPOTHESIS

a likely connection that still needs to be tested

Microneedling at a Glance

ORIGIN:

Microneedling is not a substance but a mechanical procedure: a device with fine needles creates many small, controlled injuries in the skin and breaches its barrier. Needle length determines which skin layer is reached; a common variant combines the needles with radiofrequency energy. The piercing is usually followed by a topical preparation, which is why research predominantly examines the procedure as an access route and enhancer.

EVIDENCE BASE:

717 evaluated studies · 205 controlled human studies · 319 observational studies · 34 review articles · 6 animal studies · 4 cell-culture studies

STRONGEST EVIDENCE:

- Skin, androgenetic alopecia: a randomised pilot study in 100 patients compared weekly microneedling plus 5 % minoxidil with minoxidil alone; the change in hair count at week 12 was 91.4 versus 22.2.
- Skin, melasma: a randomised open study in 60 patients compared tranexamic-acid microinjections with their combination with microneedling; MASI improvement was 35.72 % versus 44.41 %.
- Skin, hair loss: a split-scalp study in 19 men found fractionated radiofrequency microneedling plus minoxidil improved hair count (P = 0.01) and hair thickness (P = 0.02) more than minoxidil alone.
- Inflammatory processes, acne: a split-face study in 20 persons showed an 80 % reduction in inflammatory lesions and a 65 % reduction in non-inflammatory lesions after twelve weeks under fractionated microneedling radiofrequency.
- Skin, atrophic acne scars: a systematic review of nine randomised controlled studies classifies microneedling as effective, both as monotherapy and in combination.

LIMITATIONS:

- The majority of controlled studies examine microneedling together with a second intervention; the effect of needling alone cannot be derived from them.
- Microneedling has no dose in the usual sense: needle length, application pressure, number of passes, session interval and device are the variables and differ between studies.
- Many controlled studies carry notes such as pilot study, open comparison or comparison of two devices; the mechanism level is additionally supported by cell and animal studies.

CLASSIFICATION:

Microneedling is a mechanical procedure that controllably opens the skin barrier and is predominantly examined as an access route and enhancer.

1. What Microneedling Is

Microneedling uses a device with fine needles to create many small injuries in the skin. It is a mechanical procedure and not an active substance: nothing is introduced; instead the skin barrier is controllably breached. Needle length determines which skin layer is reached. A common variant combines the needles with radiofrequency energy and delivers energy into deeper layers. In use, the piercing is usually followed by a topical preparation: a serum, a medicinal product, a solution. This combination precisely shapes the research. The procedure is predominantly examined as an access route and enhancer, less often as a stand-alone treatment.

Readers of the studies encounter a problem that affects all of them: microneedling has no dose in the usual sense. Needle length, application pressure, number of passes, session interval and device are the actual variables, and they differ between studies. In addition, the majority of controlled studies examine the procedure together with a second intervention, for example minoxidil, tranexamic acid, platelet-rich plasma, radiofrequency, laser or a photosensitiser. The effect of needling alone cannot be derived from such a combination. Equally important is the separation of endpoints: some studies measure uptake and tissue reaction, others measure clinical scores, and still others measure tolerability. These levels are not interchangeable.

2. What the Studies Show in Detail

The key human studies and the most important reviews — by application area, with population, duration, preparation, measure and result as reported in the original papers. Numbers appear only where the study states them.

Distribution of **controlled human studies** by application area — the numbers are not additive because one study may be assigned to several areas:

APPLICATION AREA	CONTROLLED STUDIES
Safety and Tolerability	119
Skin	104
Inflammatory Processes	32
Immune System	20
Fatigue and Stress	9
Heart and Circulation	6

APPLICATION AREA	CONTROLLED STUDIES
Metabolism	5
Uptake and Availability	4

Skin

In 100 patients with mild to moderate androgenetic alopecia (grade III vertex or IV) a randomised, blinded-evaluated pilot study compared a weekly microneedling treatment plus twice-daily 5 % minoxidil lotion with 5 % minoxidil lotion alone ²¹. Hair count was recorded in a 1 cm² tattooed target area at baseline and at week 12. The mean change in hair count at week 12 was substantially greater in the microneedling group than in the minoxidil group (91.4 vs. 22.2). A blinded investigator additionally assessed the global photographic response on a 7-point scale. The study is designed as a pilot study; the 12-week observation period limits what it can say about lasting effects.

A randomised, controlled, blinded split-face study in 25 women tested a secretome from endothelial progenitor cells differentiated from human embryonic stem cells (hESC-EPC) against saline ²⁷. A 0.25-mm microneedle roller was used to enhance epidermal penetration; five sessions were performed at two-week intervals. Physician global assessment of pigmentation and wrinkles showed a statistically significant effect of the combination of microneedling and hESC-EPC conditioned medium versus microneedling alone ($p < 0.05$); Mexameter and Visiometer measurements also showed significant effects on pigmentation and wrinkles ($p < 0.05$). The only adverse event was mild scaling in one participant.

A randomised study compared three approaches in 90 patients with atrophic scars: 28 patients received microneedling in one session every four weeks, 34 patients received intradermal injections of platelet-rich plasma every two weeks, and 28 patients received alternating sessions of both procedures at two-week intervals for a maximum of six sessions ²⁹. In all groups, the appearance of the scars improved with a reduction in the scores of the clinical assessment scale; the improvement was most pronounced in the combination group. A randomised split-face study in 21 patients with atrophic acne scars compared microneedling radiofrequency on one half of the face with an ablative fractional Er:YAG laser 2940 nm on the other, over four monthly sessions ³⁷. Both sides improved clinically significantly without significant difference; optical coherence tomography showed a significant increase in epidermal and dermal thickness. The radiofrequency was better tolerated, with shorter downtime and fewer side effects.

An intraindividual, randomised clinical study in 12 healthy volunteers compared physical pretreatments — curettage, microdermabrasion, microneedling with dermarollers, ablative fractional laser, non-ablative fractional laser and no pretreatment — before a three-hour incubation with methyl aminolevulinate followed by red-light irradiation ²⁶. The primary endpoint was the accumulation of protoporphyrin IX; secondary endpoints included photobleaching, local skin reactions, skin redness, transepidermal water loss and participant-rated pain. All twelve participants completed the protocol. A review article with linear multivariable regressions reported that microneedling as monotherapy increased total hair count more than topical minoxidil 5 % ($\beta = 12.29$; $p < 0.001$) and that the combination with topical minoxidil 5 % increased total hair count more than microneedling alone ($\beta = 7.63$; $p < 0.05$) ³². A systematic review on hair loss included 22 clinical studies with 1127 participants; Jadad scores ranged from 1 to 3 (mean 2) ⁴⁷.

Review articles pool the evidence across multiple indications. A systematic review of randomised controlled trials on atrophic acne scars included nine RCTs and found microneedling effective as monotherapy or in combination ⁴⁸. A critical review on radiofrequency microneedling identified 42 higher-quality studies, including 14 on skin rejuvenation, seven on acne scars and six on acne vulgaris ⁴⁶. A systematic review on melasma cites a prevalence of 8.8 % to 40 % and classifies microneedling and peeling as effective, but leaves superiority over topical hydroquinone open ³⁸. A review on lasers and energy-based devices describes that fractional radiofrequency microneedling delivers thermal energy into the dermis while sparing the epidermis ³⁹. A review on hydrogel-forming microneedles cites needles of 50–900 μm length that penetrate the stratum corneum without touching blood vessels and nerves of the dermis ⁴¹.

Safety and Tolerability

A prospective, randomised, open study in 60 patients with melasma compared localised microinjections of tranexamic acid (30 patients) with tranexamic acid in combination with microneedling (30 patients) ²². Treatment was given at monthly intervals (week 0, 4 and 8), with three-month follow-up; the modified Melasma Area Severity Index (MASI), patient global assessment and physician global assessment were recorded. In the microinjection group the improvement in MASI score was 35.72 %, in the microneedling group 44.41 % at the third follow-up visit. An improvement of more than 50 % was shown by six patients (26.09 %) in the microinjection group versus twelve patients (41.38 %) in the microneedling group. No serious adverse events occurred in either group.

A randomised comparative study in 100 consecutive melasma patients (8 men, 92 women, 18 to 55 years) tested oral tranexamic acid (250 mg twice daily) against intradermal microinjections (4 mg/mL every four weeks) over twelve weeks; it did not investigate microneedling ⁴². The study was completed by 39 patients in the oral group and 41 patients in the microinjection group. A very good response (over 75 % reduction) was shown by 25 and 32 patients respectively, a good response (50 % to under 75 %) by 14 and 9 patients. The mean MASI reduction after twelve weeks was 77.96 ± 9.39 in the oral group and 79.00 ± 9.64 in the microinjection group.

A randomised, controlled split-scalp study in 19 Chinese men with male-pattern hair loss combined five sessions of fractional radiofrequency microneedling at four-week intervals with twice-daily 5 % topical minoxidil on one half of the scalp, while the other half received minoxidil only ³³. After five months the mean hair count rose from 44.12 ± 21.58 to 73.14 ± 25.45 on the combination side and from 46.22 ± 18.77 to 63.21 ± 19.22 on the monotherapy side; mean hair thickness rose from $53 \pm 13 \mu\text{m}$ to $71 \pm 15 \mu\text{m}$ and from $52 \pm 16 \mu\text{m}$ to $66 \pm 14 \mu\text{m}$ respectively. The combination side showed greater improvement in hair count ($P = 0.01$) and hair thickness ($P = 0.02$). A randomised split-face study in 30 patients with atrophic acne scars compared an ablative fractional Er:YAG laser with microneedling over five treatments at monthly intervals ³⁵. After three months both procedures showed clinical and histological improvement, with a markedly better result for the laser (70 % vs. 30 %, $p < 0.001$); the laser side had lower pain scores, the microneedling side a shorter downtime.

Inflammatory Processes

A randomised, single-blind split-face study in 20 persons with mild to moderate acne and acne scars compared fractional microneedling radiofrequency with bipolar radiofrequency over two sessions at four-week intervals and twelve-week observation ²⁸. Fractional microneedling radiofrequency was more effective for acne scars, especially ice-pick and boxcar scars; inflammatory and non-inflammatory acne lesions decreased by 80 % and 65 % respectively on the treated side by the final visit at twelve weeks, and sebum excretion decreased significantly. Apart from erythema, no serious adverse events occurred; expression of TGF β and collagen was increased. A twelve-week, prospective, randomised split-face study treated one cheek twice at four-week intervals with fractional microneedling radiofrequency in rosacea, while the other remained untreated ³⁴. The erythema index fell by 13,6 %, the a*-value by 6,8 % after twelve weeks; immunohistochemical staining showed reduced expression of markers for inflammation, innate immunity and angiogenesis.

Two blinded dermatologists assessed before as well as two and six months after treatment with the validated "Quantitative Global Grading System for Postacne Scarring" scale. Erythema after each session lasted longer in the laser group, and 13,6 % of participants developed post-inflammatory hyperpigmentation; none was observed in the microneedling group. A 20-week, randomised split-face study in 25 Korean patients with mild to moderate acne compared a 1450-nm diode laser with fractional microneedling radiofrequency over three sessions at four-week intervals ³¹. Both procedures improved acne and seborrhoea; at twelve-week follow-up fractional microneedling radiofrequency was superior, and patient satisfaction with acne, skin texture and acne scars was higher.

A comprehensive review on microneedling in humans lists effects and safety in scars, acne, melasma, photodamage, skin rejuvenation, hyperhidrosis and alopecia as well as for facilitation of transdermal drug delivery ²³. Permanent adverse events are rare; transient erythema and post-inflammatory hyperpigmentation are reported more frequently. A review on advances and new application areas describes microneedling as very simple, safe and minimally invasive and emphasises suitability for dark skin types, in which other epidermis-damaging procedures carry a high risk of post-inflammatory pigmentation ⁴³. Another review classifies microneedling as a well-tolerated, cost-effective option and notes that efficacy in vitiligo remains limited ⁴⁴. A paper on skin-cell proliferation by microneedles describes that the healing phases are markedly shortened and healing does not end in scar formation ⁴⁵.

Further Investigations

A randomised controlled split-mouth study in 33 systemically healthy patients with thin periodontal phenotype compared injectable platelet-rich fibrin alone with the combination of microneedling and injectable platelet-rich fibrin ²⁴. Treatment was given in four sessions at ten-day intervals; clinical periodontal measurements, gingival thickness and width of keratinised tissue were recorded before treatment and monthly for six months after the last injection. Gingival thickness increased in the fibrin group from 0,43 mm $\pm$ 0,14 to 0,62 mm $\pm$ 0,11 ($p < 0,001$) and in the combination group from 0,4 mm $\pm$ 0,14 to 0,66 mm $\pm$ 0,12 ($p < 0,001$). At the six-month comparison the groups differed statistically significantly in favour of the combination.

Global photographs at baseline and at the end of the study period as well as trichoscopic images of a defined area from which hair count was determined were recorded. A randomised study in 71 Chinese men with androgenetic alopecia compared three groups: 23 men received 5 % minoxidil twice daily for 24 weeks, 23 men received a microneedle treatment every three weeks for eight sessions, and 25 men received the combination over 24 weeks ³⁶. Hair density and diameter were measured before and after treatment every three weeks, with six-month follow-up after the last treatment; in the combination group the expression of molecules of the Wnt/ β -catenin signalling pathway was examined in scalp tissue samples.

A review on the treatment of androgenetic alopecia classifies microneedling alongside low-level laser therapy and platelet-rich plasma as a new, extensively investigated option in the literature ²⁵. It notes that the quality of evidence varies widely and that randomised, double-blind clinical studies are still required to assess the clinical efficacy of some procedures appropriately; standardised treatment protocols are demanded for platelet-rich plasma and low-level laser therapy.

Overall Picture

Across the fields, combination therapy contributes most: in androgenetic alopecia microneedling as monotherapy increased total hair count more than topical minoxidil 5 % ($\beta = 12,29$; $p < 0,001$), and the combination of both increased it more than microneedling alone ($\beta = 7,63$; $p < 0,05$) ³²; in the split-scalp study in 19 men the combination of fractional radiofrequency microneedling and minoxidil was superior for hair count ($P = 0,01$) and hair thickness ($P = 0,02$) ³³. In scars and acne, microneedling showed comparable results to laser and radiofrequency procedures in several randomised comparisons, with a more favourable tolerability profile: no post-inflammatory hyperpigmentation in the microneedling group versus 13,6 % in the laser group ³⁰ and shorter downtime ³⁵.

Where the evidence is still at an early stage can be stated clearly: microneedling has been combined with other procedures in hair-loss studies ³², and the precise mechanism of action is regarded as not yet determined ³². For translation into clinical application with hydrogel-forming microneedles the review names open challenges ⁴¹. Standardised treatment protocols for frequency, interval and device settings are still lacking ^{40 44}, and for individual indications such as melasma the question of superiority over topical hydroquinone remains an open, testable question ³⁸.

Methodology of the Evidence Base

Among the supporting controlled human studies are randomised trials with intraindividual design: split-face in acne scars, rosacea and skin rejuvenation ^{37 34 30}, split-scalp in hair loss ³³, split-mouth in periodontology ²⁴. Participant numbers range from 12 healthy volunteers ²⁶ through 19 to 25 patients ^{33 31} up to 100 recruited cases ^{21 42}. Typical treatment durations comprise three to five sessions at monthly intervals; follow-up ranges from twelve weeks to six months ^{36 24}. Endpoints are hair count and hair thickness, MASI, validated scar scales, erythema index, optical coherence tomography, histology and immunohistochemistry. Larger samples with long-term follow-up, uniform device settings and blinded protocols are systematically lacking; several reviews call for precisely these steps ^{48 47 25}.

The Thesis: Almost Always the Combination, Not the Procedure, Is Tested

The most frequently cited controlled studies in the field examine combinations: minoxidil plus microneedling versus minoxidil alone, tranexamic acid with and without microneedling in melasma, microneedling with platelet-rich plasma in atrophic scars, radiofrequency microneedling versus bipolar radiofrequency, fractional erbium laser versus microneedling, a photosensitiser after needling preparation. This is realistic for practice, because this is how the procedure is applied. For assessment, however, these studies contribute the effect of the combination. Anyone wishing to classify microneedling as an independent measure needs controlled arms without a second intervention.

The second observation lies in endpoint selection. A large block of controlled human studies is designed around safety. This is reliable information on the tolerability of a procedure that mechanically opens the skin, and is by no means secondary. It is, however, not a statement on efficacy. Conversely, the frequently cited 2012 work on cell proliferation is preclinical mechanistic research: it describes a

PLAUSIBLE pathway and carries no clinical endpoint. Both types of evidence are often conflated in discussion, and that is precisely where the critical point lies.

3. How Robust the Research Is

The research is distributed across a few fields. Hair loss, acne scars, melasma and acne itself are the most densely documented; individual studies also address periodontal tissue, preparation for photodynamic therapy and skin ageing. The largest block of controlled human studies concerns safety endpoints, followed by skin endpoints. Inflammatory, immunological, cardiovascular, metabolic and oncological questions are represented by individual studies; research here is at an early stage. The best-known studies in the field are dermatological: the randomised pilot study on androgenetic alopecia from 2013, the comparison of tranexamic-acid injections with and without microneedling in melasma from 2013, and the systematic review on alopecia from 2023.

Methodologically, the field has a strength that is not self-evident with a visible intervention: split-face and split-scalp designs compare treated and untreated areas on the same person, blinded assessors evaluate the result, and randomisation is explicitly implemented in several studies. At the same time, many controlled studies carry a note that limits their weight: pilot study, open comparison, comparison of two devices. The mechanism level is additionally supported by cell and animal studies. **Hypothesis:** The accumulation of safety endpoints also reflects the documentation requirement for a procedure that mechanically opens the skin barrier.

4. What Is Frequently Claimed — and What the Data Support

CLAIM	STUDY EVIDENCE
Microneedling for androgenetic hair loss	Investigated, but predominantly in combination with minoxidil or radiofrequency, in some cases as a split-scalp pilot study. The 2022 systematic review synt
Microneedling as an absorption aid for active ingredients	Investigated among other things for tranexamic acid in melasma and for the uptake of protoporphyrin IX prior to photodynamic therapy. Such studies measur
Microneedling for skin rejuvenation	The 2014 randomised split-face study tests a stem cell-conditioned medium in combination with microneedling. A combination study does not permit conclu
Radiofrequency microneedling for acne and acne scars	Several randomised comparisons pit it against bipolar radiofrequency or fractional lasers. They show how two procedures compare with each other, not how

5. The Most Robust Studies

Ordered by strength of evidence, not by familiarity: systematic reviews and studies with many participants first. The complete evaluation includes significantly more studies; the most robust ones are listed here.

Controlled Studies in Humans

- ¹ Comparing the efficacy and safety of microneedling and its combination with other treatments in patients with acne scars: a network meta-analysis of ... (2024) — Systematic review, 1,546 participants
- ² Microneedling for Non-cosmetic Dermatologic Conditions: A Systematic Review of Efficacy and Safety (2025) — Systematic review, 1,200 participants
- ³ Microneedling Versus Chemical Peels for Atrophic Acne Scars: A Systematic Review and Meta-Analysis (2026) — Systematic review, 713 participants
- ⁴ Laser, Microneedling, and Combination Therapies for Moderate to Severe Acne Atrophic Scars: A Systematic Review and Network Meta-Analysis (2026) — Systematic review, 1,488 participants

- ⁵ Efficacy and safety of combinational therapy using topical minoxidil and microneedling for the treatment of androgenetic alopecia: a systematic ... (2023) — Systematic review, 466 participants
- ⁶ Combined Effect of Microneedling and Platelet-Rich Plasma for the Treatment of Acne Scars: A Meta-Analysis (2021) — Systematic review, 472 participants
- ⁷ Microneedling Monotherapy for Acne Scar: Systematic Review and Meta-Analysis of Randomized Controlled Trials (2022) — Systematic review, 414 participants
- ⁸ Fractional Radiofrequency Microneedling as a Monotherapy in Acne Scar Management: A Systematic Review of Current Evidence (2025) — Systematic review, 481 participants
- ⁹ Microneedling with cutaneous delivery of topical agents for the treatment of melasma: A systematic review (2022) — Systematic review, 368 participants
- ¹⁰ A Network Meta-analysis to Explore the Effectiveness of the Different Treatment Modalities in Acne Scars (2024) — Systematic review, 495 participants
- Effectiveness and Tolerability of Various 5-Fluorouracil Formulations as Adjuvant Therapies for Vitiligo Management: A Systematic Review and ... (2025) — Systematic review, 302 participants
- ¹¹ A systematic review of procedural modalities in the treatment of lichen planopilaris, frontal fibrosing alopecia, and discoid lupus erythematosus (2025) — Systematic review, 411 participants
- ¹² Comparing Combined Non-ablative Fractional Laser and Radiofrequency Microneedling Versus Non-ablative Fractional Laser Alone for Acne Scar Treatment ... (2025) — Systematic review, 116 participants
- ¹³ The efficacy and safety of microneedling combined with tacrolimus versus tacrolimus monotherapy for vitiligo treatment: a ... (2025) — Systematic review, 148 participants
- ¹⁴ Efficacy and safety of microneedling with tranexamic acid versus microneedling with vitamin C in the treatment of melasma: a systematic review and ... (2026) — Systematic review, 232 participants
- ¹⁵ Fractional CO2 Laser Versus Micro Needling Radiofrequency for Post Acne Scarring: A Meta-Analysis of RCTs (2026) — Review article, 249 participants
- ¹⁶ Efficacy of Combinational Therapy Using Topical Minoxidil and Microneedling for The Treatment of Androgenetic Alopecia: A Systematic Review and ... (2023) — Review article, 466 participants
- ¹⁷ Microneedling as a Treatment for Acne Scarring: A Systematic Review (2020) — Review article
- The effectiveness of combination therapies for androgenetic alopecia: A systematic review and meta-analysis (2020) — Review article
- ¹⁸ Evaluating the efficacy and safety of combined microneedling therapy versus topical Minoxidil in androgenetic alopecia: a systematic review and ... (2025) — Review article
- ¹⁹ Efficacy and safety of combined microneedling therapy for androgenic alopecia: A systematic review and meta-analysis of randomized clinical trials (2024) — Review article
- Platelet Rich Plasma Combination Therapies for Treatment of Androgenetic Alopecia: A Systematic Review (2023) — Review article
- ²⁰ Systematic review of clinical studies assessing the needling for treatment of melasma: Focusing on efficacy, safety, and recurrence rate (2022) — Review article
- Intradermal Injection of Tranexamic Acid for the Treatment of Adult Melasma: A Systematic Review and Meta-Analysis of Randomized Controlled Trials (2025) — Review article

6. Summary

In humans, the most densely documented are hair loss, acne scars, melasma and acne; inflammatory, immunological, cardiovascular, metabolic and oncological questions are represented by individual studies; here research is at the beginning. Several randomised studies show advantages of the combination over topical application alone, for example in androgenetic alopecia and in melasma. A systematic review of nine randomised controlled studies classifies microneedling in atrophic acne scars as effective, as monotherapy as well as in combination. The largest block of controlled studies in humans concerns safety endpoints, followed by skin endpoints; permanent adverse events are rare, transient erythema and post-inflammatory hyperpigmentation are reported more frequently.

Plausible is the mechanism: The procedure breaks through the skin barrier in a controlled manner, and studies on skin cell proliferation describe significantly shortened healing phases that do not end in scar formation. Reviews emphasise the suitability for dark skin types, where epidermis-damaging procedures carry a high risk of post-inflammatory pigmentation. **Hypothesis:** From the good tolerability and the shorter downtime it could follow that microneedling establishes itself further as an access route for active ingredients, provided the parameters are standardised.

What would need to be clarified is a controlled trial that tests microneedling alone against a defined comparison group and determines the actual variables: needle length, application pressure, number of passes, session interval and device. Equally necessary is the separation of endpoints, because uptake and tissue reaction, clinical scores and tolerability are not interchangeable. In melasma, a systematic review leaves the superiority over topical hydroquinone open; in vitiligo, a review considers the efficacy to be limited. A study that addresses these questions with uniform parameters and blinded assessment would show what the procedure achieves alone.

7. What Remains Open

- **Monotherapy:** Which randomised study tests microneedling alone against a sham-treated control, without a second active ingredient and without a second device?
- **Blinding:** Can a needle procedure be concealed from participants at all, and to what extent do blinded assessors and split designs support the results?
- **Course documentation:** Which studies record what happens after the end of a session series, and with which endpoint is it measured?

Frequently Asked Questions

How is microneedling predominantly tested in controlled studies?

Mostly in combination with a second intervention: minoxidil for androgenetic alopecia, tranexamic acid for melasma, platelet-rich plasma for atrophic scars, radiofrequency energy or a fractional laser in device comparisons. For practice, this corresponds to the usual application. For evaluation, this means that the studies support the combination; they do not allow statements about needling alone.

Which application areas are best studied?

The densest documentation covers hair loss, acne scars, melasma and acne, plus individual studies on periodontal tissue and preparation before photodynamic therapy. The largest block of controlled human studies concerns safety endpoints and thus the tolerability of the procedure. Inflammatory, cardiovascular, metabolic and oncological questions are represented with individual studies.

What is different about radiofrequency microneedling?

In this variant, the needles additionally deliver radiofrequency energy into the depth. The field treats it as its own technique: the critical review from 2021 summarises it, randomised comparisons set it against bipolar radiofrequency and against fractional lasers. The results of such studies apply to the device as a whole, not to the piercing alone.

Sources

- 1 Comparing the efficacy and safety of microneedling and its combination with other treatments in patients with acne scars: a network meta-analysis of randomized controlled trials
Li H, Jia B, Zhang X · 2024
- 2 Microneedling for Non-cosmetic Dermatologic Conditions: A Systematic Review of Efficacy and Safety
Mashi A, Oraybi RA, Hakami MS, Altalhi AM, Alrezqi WA, Hakami TK et al. · 2025
- 3 Microneedling Versus Chemical Peels for Atrophic Acne Scars: A Systematic Review and Meta-Analysis
Agu-Jefferson I, Gebregiorgis TT, Ozumba L, Atoe-Imagbe OM, Ilesanmi ON · 2026
- 4 Laser, Microneedling, and Combination Therapies for Moderate to Severe Acne Atrophic Scars: A Systematic Review and Network Meta-Analysis
Ou Y, An G, Liang J, Zhang W, Li M, Luo Y et al. · 2026
- 5 Efficacy and safety of combinational therapy using topical minoxidil and microneedling for the treatment of androgenetic alopecia: a systematic review and meta-analysis
Abdi P, Awad C, Anthony MR, Farkouh C, Kenny B, Maibach HI et al. · 2023
- 6 Combined Effect of Microneedling and Platelet-Rich Plasma for the Treatment of Acne Scars: A Meta-Analysis
Kang C, Lu D · 2021
- 7 Microneedling Monotherapy for Acne Scar: Systematic Review and Meta-Analysis of Randomized Controlled Trials
Shen YC, Chiu WK, Kang YN, Chen C · 2022
- 8 Fractional Radiofrequency Microneedling as a Monotherapy in Acne Scar Management: A Systematic Review of Current Evidence
Niaz G, Ajeebi Y, Alshamrani HM, Khalmurad M, Lee K · 2025
- 9 Microneedling with cutaneous delivery of topical agents for the treatment of melasma: A systematic review
Brasil Dos Santos J, Nagem Lopes LP, de Lima GG, Teixeira da Silva R, da Silva E Souza Lorca B, Miranda Pinheiro G et al. · 2022
- 10 A Network Meta-analysis to Explore the Effectiveness of the Different Treatment Modalities in Acne Scars
Jiang M, Liu T, Liu X, Liu L, Jiang X, Zhang Z et al. · 2024
- 11 A systematic review of procedural modalities in the treatment of lichen planopilaris, frontal fibrosing alopecia, and discoid lupus erythematosus
Tanha AE, Ghane Y, Jafarzadeh A, Goodarzi A · 2025
- 12 Comparing Combined Non-ablative Fractional Laser and Radiofrequency Microneedling Versus Non-ablative Fractional Laser Alone for Acne Scar Treatment: A Meta-Analysis
Hassan Awaji HH, Bakhamees BH, Alruwali M, Alhumaid F, Albenayyan SA, Ajaj AA et al. · 2025
- 13 The efficacy and safety of microneedling combined with tacrolimus versus tacrolimus monotherapy for vitiligo treatment: a systematic review and meta-analysis
Maaddawi HA, Aljuaid AA, Alamri AM, Alghowairi DH, Bawazeer AS · 2025
- 14 Efficacy and safety of microneedling with tranexamic acid versus microneedling with vitamin C in the treatment of melasma: a systematic review and meta-analysis
Roddaje T, Saowarat S, Norchai P · 2026
- 15 Fractional CO2 Laser Versus Micro Needling Radiofrequency for Post Acne Scarring: A Meta-Analysis of RCTs
Argobi Y, Tobeigei F, Alasiri FI · 2026
- 16 Efficacy of Combinational Therapy Using Topical Minoxidil and Microneedling for The Treatment of Androgenetic Alopecia: A Systematic Review and Meta-Analysis
Abdi P, Awad C, Anthony MR, Farkouh C, Kenny B, Maibach H · 2023
- 17 Microneedling as a Treatment for Acne Scarring: A Systematic Review
Mujahid N, Shareef F, Maymone MBC, Vashi NA · 2020
- 18 Evaluating the efficacy and safety of combined microneedling therapy versus topical Minoxidil in androgenetic alopecia: a systematic review and meta-analysis
Ahmed KMA, Kozaa YA, Abuawwad MT, Al-Najdawi AJ, Mahmoud YW, Ahmed AM et al. · 2025
- 19 Efficacy and safety of combined microneedling therapy for androgenic alopecia: A systematic review and meta-analysis of randomized clinical trials
Pei D, Zeng L, Huang X, Wang B, Liu L, Zhang G · 2024
- 20 Systematic review of clinical studies assessing the needling for treatment of melasma: Focusing on efficacy, safety, and recurrence rate
Sadeghzadeh-Bazargan A, Behrang E, Najjar Nobari N, Ghassemi M, Roohaninasab M, Goodarzi A · 2022
- 21 A randomized evaluator blinded study of effect of microneedling in androgenetic alopecia: a pilot study
Dhurat R, Sukesh M, Avhad G, Dandale A, Pal A, Pund P · 2013
- 22 A Randomised, Open-label, Comparative Study of Tranexamic Acid Microinjections and Tranexamic Acid with Microneedling in Patients with Melasma
Budamakuntla L, Loganathan E, Suresh DH, Shanmugam S, Suryanarayan S, Dongare A et al. · 2013
- 23 Microneedling: A Comprehensive Review
Hou A, Cohen B, Haimovic A, Elbuluk N · 2017
- 24 Injectable platelet-rich fibrin and microneedling for gingival augmentation in thin periodontal phenotype: A randomized controlled clinical trial
Ozsagır ZB, Sağlam E, Sen Yılmaz B, Choukroun J, Tunali M · 2020
- 25 Treatment of Androgenetic Alopecia: Current Guidance and Unmet Needs
Kaiser M, Abidin R, Gaumond SI, Issa NT, Jimenez JJ · 2023
- 26 Comparison of Physical Pretreatment Regimens to Enhance Protoporphyrin IX Uptake in Photodynamic Therapy: A Randomized Clinical Trial
Bay C, Lerche CM, Ferrick B, Philipsen PA, Togsverd-Bo K, Haedersdal M · 2017
- 27 Efficacy of microneedling plus human stem cell conditioned medium for skin rejuvenation: a randomized, controlled, blinded split-face study
Lee HJ, Lee EG, Kang S, Sung JH, Chung HM, Kim DH · 2014
- 28 Comparison of fractional microneedling radiofrequency and bipolar radiofrequency on acne and acne scar and investigation of mechanism: comparative randomized controlled clinical trial
Min S, Park SY, Yoon JY, Suh DH · 2015
- 29 Therapeutic effect of microneedling and autologous platelet-rich plasma in the treatment of atrophic scars: A randomized study
Ibrahim ZA, El-Ashmawy AA, Shora OA · 2017
- 30 Comparison of Nonablative Fractional Erbium Laser 1,340 nm and Microneedling for the Treatment of Atrophic Acne Scars: A Randomized Clinical Trial
Cachafeiro T, Escobar G, Maldonado G, Cestari T, Coriela O · 2016
- 31 Novel device-based acne treatments: comparison of a 1450-nm diode laser and microneedling radiofrequency on mild-to-moderate acne vulgaris and seborrhea in Korean patients through a 20-week prospective, randomized, split-face study
Kwon HH, Park HY, Choi SC, Bae Y, Jung JY, Park GH · 2018
- 32 Microneedling for Hair Loss
Gupta AK, Quinlan EM, Venkataraman M, Bamimore MA · 2022
- 33 A pilot split-scalp study of combined fractional radiofrequency microneedling and 5% topical minoxidil in treating male pattern hair loss
Yu AJ, Luo YJ, Xu XG, Bao LL, Tian T, Li ZX et al. · 2018
- 34 Clinical and Histologic Effects of Fractional Microneedling Radiofrequency Treatment on Rosacea
Park SY, Kwon HH, Yoon JY, Min S, Suh DH · 2016
- 35 Fractional Erbium-Doped Yttrium Aluminum Garnet Laser Versus Microneedling in Treatment of Atrophic Acne Scars: A Randomized Split-Face Clinical Study
Osman MA, Shokeir HA, Fawzy MM · 2017
- 36 Randomized trial of electrodynamic microneedling combined with 5% minoxidil topical solution for treating androgenetic alopecia in Chinese males and molecular mechanistic study of the involvement of the Wnt/ β -catenin signaling pathway
Bao L, Zong H, Fang S, Zheng L, Li Y · 2022
- 37 Split-face comparative study of fractional Er:YAG laser versus microneedling radiofrequency in treatment of atrophic acne scars, using optical coherence tomography for assessment
Emam AAM, Nada HA, Atwa MA, Tawfik NZ · 2022
- 38 Melasma treatment: a systematic review
Neagu N, Conforti C, Agazzino M, Marangi GF, Morariu SH, Pellacani G et al. · 2022
- 39 Review of Lasers and Energy-Based Devices for Skin Rejuvenation and Scar Treatment With Histologic Correlations
Chen SX, Cheng J, Watchmaker J, Dover JS, Chung HJ · 2022
- 40 Microneedling for the Treatment of Scars: An Update for Clinicians
Juhász MLW, Cohen JL · 2020
- 41 Advances and Prospects for Hydrogel-Forming Microneedles in Transdermal Drug Delivery
Hou X, Li J, Hong Y, Ruan H, Long M, Feng N et al. · 2023
- 42 Therapeutic efficacy and safety of oral tranexamic acid and that of tranexamic acid local infiltration with microinjections in patients with melasma: a comparative study
Sharma R, Mahajan VK, Mehta KS, Chauhan PS, Rawat R, Shiny TN · 2017
- 43 Microneedling: Advances and widening horizons
Singh A, Yadav S · 2016
- 44 Review of applications of microneedling in dermatology
Iriarte C, Awosika O, Rengifo-Pardo M, Ehrlich A · 2017
- 45 Skin cell proliferation stimulated by microneedles
Liebl H, Kloth LC · 2012
- 46 Radiofrequency Microneedling: A Comprehensive and Critical Review
Tan MG, Jo CE, Chapas A, Khetarpal S, Dover JS · 2021
- 47 Microneedling and Its Use in Hair Loss Disorders: A Systematic Review
English RS, Ruiz S, DoAmaral P · 2022
- 48 Microneedling in the treatment of atrophic scars: A systematic review of randomised controlled trials
Sitohang IBS, Sirait SAP, Suryanegara J · 2021

International Health Research

Research, put in context. Every statement leads to the original paper; the decision in the individual case rests with the treating professional.
ih-research.com/en/knowledge/microneedling/ · Last updated 2026-10-15