**Supplemental Tables**

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| **Table S1.** Medical subject headings (MESH) and non-MESH search terms, | |
|  | **Search Terms** |
| Vitiligo | Non-MESH: Vitiligo; Depigmentation; Hypopigmentation  MESH: Vitiligo; Vitiligo/surgery; Vitiligo/therapy |
| Platelet-rich plasma | Non-MESH: platelet-rich plasma, PRP  MESH: platelet-rich fibrin, platelet releasate, platelet rich plasma |
| Microneedling | Non-MESH: Microneedling, needling |
| Micropigmentation | Non-MESH: micropigmentation, tattooing, permanent makeup, camouflage  MESH: tattooing |
| Ablation therapies | Non-MESH: fractional co2 laser, co2 laser, fractional carbon dioxide laser, erbium laser, erbium yag laser, er yag laser, dermabrasion, ablation, abrasion  MESH: co2 laser, erbium yag laser, laser, erbium yag, dermabrasion |
| Surgical therapies | Non-MESH: graft, cell suspension, cultured melanocyte, non-cultured melanocyte, melanocyte-keratinocyte suspension, blister graft, suction blister graft, suction blister transplantation, blister roof transplantation, Thiersch graft, punch graft, epidermal cell suspension transplantation, epidermal cell transplantation, split-thickness graft, split-thickness skin graft, split-skin graft, epithelial graft, epidermal graft  MESH: skin transplantation, autologous transplantation, cell transplantation |

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| **Table S2. Clinical trials using platelet-rich plasma (PRP) for the treatment of vitiligo.** | | | | | | | |
| **Citation** | **Study design** | **N** | **Interventions** | **Follow-up** | **Outcome measures** | **Results** | **Adverse effects** |
| Abdelghani et al. (1) | Parallel group comparative study | 80 | Fractional CO2 laser, PRP, combined fractional CO2 laser and PRP, and combined fractional CO2 laser and NB-UVB | 3 months | Grade 0: 0%, Grade 1: 1-5%, Grade 2: 6-25%, Grade 3: 26-50%, Grade 4: 51-75%, Grade 5: 76-100% | **Laser + PRP**: 8/20 achieved grade 5; Average grade 4.4+/-0.503 SD  **Laser and NB-UVB**: 1/20 achieved grade 5; Average grade 2.60 +/-1.635 SD  **Laser only**: 2/20 achieved grade 5; Average grade 1.90+/-1.334 SD  **PRP only**: 4/20 achieved grade 5; Average grade 1.50 +/-1.850 SD  Kruskal-Wallis P<0.001 | Erythema <24 hours after CO2 laser and NB-UVB therapy |
| Kadry et al. (2) | Intrapatient placebo-controlled study | 30 | PRP group, combined CO2 laser with PRP, CO2 laser group, control group | 3 months | Grade 1: <25%  Grade 2: 25-49%,  Grade 3: 50-74%, Grade 4: 75-99%, Grade 5: 100% | Average grade:  **PRP**= 2.97 +/- 1.16 SD  **Laser + PRP**= 3.2-+/-1.27 SD  **Laser**= 2.30+/-1.27 SD  **Control**= 1.20+/-0.55 SD  Kruskal-Wallis P <0.001 | Pain: 33.33% in laser, 33.33% in PRP, 23% in laser + PRP groups.  Hyperpigmentation: 26.66% in laser, 6.66% in PRP group. |
| Khattab et al. (3) | Parallel group comparative study | 52 | PRP and excimer laser *versus* excimer laser only | 3 months | <25%, >25-50%, >50-75%, >75-100% | **PRP + Excimer**: 4/26 <25%, 9/26 >75%  **Excimer only**: 17/26 <25%, 0/26 >75%  Chi-square P<0.001 | Short-lived pain in 23% of PRP + excimer patients. |
| Ibrahim et al. (4) | Intrapatient comparative study | 60 | Left side NB-UVB only *versus* right side with NB-UVB + PRP | 3 months | <25%, >25-50%, >50-75%, >75-100% | **PRP + NB-UVB**: 6/60 <25%, 33/60 >75%  **NB-UVB only**: 45/60 <25%, 0/60 >75%  Chi-square P<0.001 | Pain and ecchymosis in 15% of PRP injection sites. |
| Parambath et al. (5) | Intrapatient comparative study | 21 | Non-cultured epidermal cell suspension (NCES) *versus* NCES in PRP | 3 and 6 months | 0-25, 26-50, 51-75, 76-90, 91-99, and 100% | 6 months:  **NCES + PRP**=16/20 >75%  **NCES only**: 11/20 >75%  Wilcoxon signed rank P=0.176 | Hyperpigmentation (15/21), 1 patient with hypertrophic scarring. |

Abbreviations: 5-FU, Fluorouracil; M-K, melanocyte-keratinocyte; NCES, non-cultured epidermal cell suspension

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| **Table S3. Clinical trials using microneedling for the treatment of vitiligo.** | | | | | | | |
| **Citation** | **Study design** | **N** | **Interventions** | **Follow-up** | **Outcome measures** | **Results** | **Adverse effects** |
| Ebrahim et al. (6) | Parallel group comparative study | 48 | Tacrolimus only (T) *versus* microneedling + tacrolimus (MN+T) | 3 months | 0%, <25%, 25–50%, 50–75%, >75% | **Tacrolimus only:** 13/24 <25%, 7/24 >75%  **Microneedling + tacrolimus:** 3/24 <25%, 12/24 >75%  Chi-square P=0.02 | None: T 14/24, MN+T 8/24  Pain: T 0/24, MN+T 10/24  Itching: T 10/24, MN+T 6/24  Chi-square P=0.002 |
| Ebrahim et al. (7) | Parallel group comparative study | 90 | Microneedling + tacrolimus (MN+T), microneedling only (MN), tacrolimus only (T) | 3 months | 0%, <25%, 25–50%, 50–75%, >75% | **Microneedling + tacrolimus**: 20/30 >75%, 3/30 <25%  **Microneedling only**: 10/30 >75%, 17/30 <25%  **Tacrolimus only**: 10/30 >75%, 15/30 <25%  Chi-square P=0.03 | None: MN+T 15/30, MN 14/30, T 12/30; Erythema: MN+T 7/30, MN 7/30, T 7/30; Pain: MN+T 8/30, MN 11/30, T 0/30; Itching: MN+T 0/30, MN 0/30, T 10/30  Chi-square P<0.001 |
| Mohaghegh et al. (8) | Intrapatient comparative study | 21 | NB-UVB with or without needling | 3 months | 0%, 0-25%, 26-50%, >50% | **NB-UVB only:** 24/41 <25%  **NB-UVB + needling**: 13/41 <25%  Wilcoxon P <0.05 | Rapidly clearing purpura at injection size. Generalized darkening of irradiated peripheral border in 5 patients. No reports of koebnerization. |
| Elshafy et al. (9) | Parallel group study | 60 | NB-UVB only, microneedling only, NB-UVB + microneedling | 3 months | 0%, <25%, 25–50%, 50–75%, >75% | **NB-UVB only**: 10/20<25%, 0/20>75%  **Microneedling only**: 7/20<25%, 3/20>75%  **Combined**: 1/20<25%, 6/20>75%  P=0.050, test type unknown | Pain; unreported % or by treatment. |
| BinSheikhan et al. (10) | Parallel group comparative study | 20 | Excimer laser *versus* excimer laser + needling | 4 months | 0%, <25%, 25–50%, 50–90%, 90-100% (Graded 1-5) | **Excimer only**: average grade=2.5  **Excimer + needling**: average grade=3.3  Standard error not provided.  Two-way ANOVA P<0001 | Minor bleeding with needling, discomfort with excimer treatment of large areas. No statistical comparisons provided. |
| Attwa et al. (11) | Intrapatient comparative study | 27 | Microneedling only (MN) *versus* microneedling + 5-FU (MN+5-FU) | 3 months | 0%, <25%, 25–50%, 50–75%, >75% | **Microneedling only:** 22/27<25%, 0/27>75%  **Microneedling + 5-FU**: 8/27 <25%, 1/27>75%  Chi-square P=0.001 | None: MN 14/27, MN+5-FU 13/27  Pain: MN 13/27, MN+5-FU 6/27  Itching: MN 0/27, MN+5-FU 3/27  Pain and itching: MN 0/27, MN+5-FU 5/27  Chi-square P=0.013 |

Abbreviations: CO2, Carbon Dioxide; NCES, non-cultured epidermal cell suspension; PRP, platelet-rich plasma, 5-FU, Fluorouracil; MN, microneedling; NB-UVB, narrowband UVB; T, tacrolimus.

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|  | **Table S4. Clinical trials using carbon dioxide (CO2) laser ablative therapy for the treatment of vitiligo.** | | | | | | | |
| **Carbon dioxide (CO2) laser** | **Citation** | **Study design** | **N** | **Interventions** | **Follow-up** | **Outcome measures** | **Results** | **Adverse effects** |
| Liu et al. (12) | Intrapatient comparative study | 126 | CO2 laser + betamethasone + NB-UVB *versus* betamethasone + NB-UVB  Settings: pulse energy of 10–15 mJ/cm2 or 70–100mJ, scan size of 10 mm, a spot density of 100–144 spots/cm2, and penetration depth of 300–450 microns | 6 months | <10%, 10-49%, 50-98%, >98% | **Laser:** 3/126 >98%, 61/126 <10% **Non-laser:** 1/126 >98%, 81/126 <10%  Chi-squared P = 0.005 | Pain, burning sensation, erythema, edema with CO2 laser for 1-3 days; 2 patients dropped out due to intolerable pain. No adverse events (infections, scarring, atrophy, Koebner phenomenon). |
| Doghaim et al. (13) | Split-body, intrapatient comparative study | 32 | NB-UVB *versus* NB-UVB + CO2 laser  Settings: 2 passes of pulse energy of 30 mJ/cm2, density level of 5 dots, depth level of 5 | 3 months | <25%, 26-50%, 51-75%, >75% | **Laser**: 10/32 >75%, 10/32 <25%  **Non-laser**: 0/40 >75%, 26/40 <25%  Wilcoxon P = 0.007 | No “noticeable adverse events” (infection, scarring, Koebner). Pain during laser treatment; burning, erythema, and crustation after laser lasting <1 week. |
| Ghasemloo et al. (14) | Intrapatient comparative study | 30 | NB-UVB + CO2 *versus* NB-UVB  Settings: pulse energy of 30–45 mJ/cm2 | 4 months | 0%, 1-25%, 26-50%, 51-75%, >75% | **Laser**: 2/30 >75%, 19/30 <25%  **Non-laser**: 0/30 >75%, 28/30 <25%  Wilcoxon P = 0.002 | All patients had erythema <1 day on both sides (no differences between groups). No infection or Koebner. |
| Esme et al. (15) | Intrapatient comparative study | 30 | CO2 + NB-UVB *versus* NB-UVB  Settings: pulse energy of 50-150 mJ/cm2, spot density of 50-200 microthermal zone (MTZ)/cm2, power of 30 W in the static mode, and 120 microns spot diameter | 4 months | <0% (worsening), 0%, 1-25%, 26-50%, 51-75%, >75% | **Laser**: 0/51 >75%, 44/51 <25%  **Non-laser**: 1/51 >75%, 39/51 <25%  Chi-squared P = 0.11 | 6 CO2-treated patches worsened (possible Koebner phenomenon). |
| Vachiramon et al. (16) | Intrapatient comparative study | 26 | CO2 laser, NB-UVB, and clobetasol *versus* NB-UBV and clobetasol  Settings: 2 passes of pulse energy of 100 mJ/cm2, spot density of 150 in static mode | 3 months | 0%, 1-25%, 26-50%, 51-75%, >75% | **Laser**: 2/26 >75%, 14/26 <25%  **Non-laser:** 1/26 >75%, 23/26 <25%  Chi-squared P = 0.07 | Pain: mean 4.49/10 in CO2 group; no scarring. Other data not reported. |
| Feily et al. (17) | Intrapatient comparative study | 20 | CO2 + AT + NB-UVB *versus* AT + NB-UVB  Settings: 1 session of pulse energy of 100 mJ/cm2, spot density of 200 in static mode | 3 months | Diameter of repigmentation around graft | Mean change in diameter (mm) was 6.6 (SD 5.8) with laser versus 4.3 (SD 1.8) without laser (P < 0.001) | Not reported. |
| Kanokrungsee et al. (18) | Intrapatient, single-blinded comparative study | 12 | CO2 + UVB + topical steroid *versus* UVB + topical steroid  Settings: 10 sessions of pulse energy of 60-100 mJ/cm2, spot density of 200 in static mode | 3 months | 0%, 1-25%, 26-50%, 51-75%, >75% | **Laser**: 4/12 >75%, 4/12 <25%  **Non-laser:** 5/12 >75%, 5/12 <25%  P > 0.05 (exact P not reported) | Koebner phenomenon in 4 experimental, 3 control. Pain, erythema in all CO2 group. |
| Shin et al. (19) | Intrapatient comparative study | 10 | CO2 laser + NB-UVB *versus* NB-UVB  Settings: 2 sessions of pulse energy of 100 mJ/cm2, spot density of 150 in static mode | 2 months | 0%, 1-25%, 26-50%, 51-75%, >75% | **Laser**: 0/10 >75%, 7/10 <25%  **Non-laser**: 0/10 >75%, 10/10 <25%  P = 0.03 | Pain, burning sensation, erythema for all patients with laser treatment (<1 day). |
| Chen et al. (20) | Parallel group comparative study | 45 | CO2 + tacrolimus *versus* tacrolimus  Settings: Multiple sessions of pulse energy of 10 mJ/cm2, spot density of 25%, depth 620 micrometers | 6 months | 0-25%, 26-75%, >75% | **Laser**: 10/22 >75%  **Non-laser**: 4/23 >75%  Chi-squared P = 0.042 | Disease progression in 2 CO2 group, 0 in control. Scarring in 1 CO2 group, 0 in control. |
| Abu Zeid et al. (21) | Intrapatient comparative study | 27 | CO2 + tacrolimus *versus* tacrolimus  Settings: 3 monthly sessions of 15W, 500 microseconds pulse duration, 500 micrometers spacing, 1 stack |  | VASI | No significant differences between treatment groups | Not reported. |
| Mohamed et al. (22) | Parallel group comparative study | 64 | CO2+5-FU (n=22) *versus* CO2 alone (n=24) *versus* 5-FU alone (n=22)  Settings: 1-2 Hz, level 2 pulse control, 0.9W | 5 months | 0%, 1-24%, 25-49%, 50-74%, ≥75% | **Laser+5-FU:** 476/955 ≥75%, 324/955 <25%  **Laser only**: 109/604 ≥75%, 505/604 <25%  **5-FU only**: 26/703 ≥75%; 648/703 <25%  P<0.0001 for achieving ≥75% | Pain during CO2 treatment, transient hyperpigmentation, 4 developed a skin infection resolving w/ topical antibiotics. Itching in 19% receiving 5FU. |
| El-Zawahry et al. (23) | Intrapatient comparative study | 34 | Cryoblebbing + M-K suspension + NB-UVB *versus* CO2 + M-K suspension + NB-UVB  Settings: 20W, 500 milliseconds pulse duration, 500 micrometers spacing, stack 1 | 18 months | VASI | No significant differences in VASI score | Infection (1 in CO2 versus 6 in cryoblebbing); not significantly different. |
| Kadry et al. (2) | Intrapatient comparative study | 30 | CO2+PRP, CO2, PRP, control  Settings: 2 passes of 30-50mJ, 0.6 density in static mode | 6 months | Vitiligo analysis by computer-assisted grid | Surface area reduction: **PRP**=57+/-30%,  **CO2 + PRP**=54%+/-37%, **CO2**=38+/36%, **Control**=14+/-40%. Grading:  **PRP**=3+/-1.16, **CO2+PRP**=3.2+/-1.27, **CO2**=2.3+/-1.27, **Control**=1.2+/-0.55 | Pain (33.3% in CO2, PRP groups, 23% in CO2+PRP; Hyperpigmentation CO2 (26.6%), PRP (6.6%). |
| Li et al. (24) | Intrapatient comparative study | 25 | CO2+betamethasone+NB-UVB *versus* CO2+NB-UVB (control)  Settings: pulse energy 70-100 J/cm2, 5.4% coverage density, 1 stack static mode | 6 months | 0% 1–25% 26–50%; 51–75%; >75% | **Treatment group**: 2/25 >75%, 9/25 <25%  **Control group**: 0/25 >75%, 17/25 < 25%  P = 0.04 | Transient pain, erythema, edema with laser (<1 day) and crusting (<1 week). |
| Makki et al. (25) | Intrapatient comparative study | 22 | CO2 laser + 5-FU + excimer *versus* mechanical-dermabrasion + 5-FU + excimer  Settings: pulse energy 30 J/cm2, repeated passing until skin peeling achieved | 3 months | 0, 1-25, 26-50, 51-75, >75% | **Laser**: 6/22 >75%, 1/22 <25%  **Mechanical dermabrasion**: 9/22 >75%, 2/22 <25%  No significant differences | CO2 laser: 4.5% scar, 9% hyperpigmentation Mechanical dermabrasion: 27.3% scar, 50% hyperpigmentation (statistically significant). |
| El-Zawahry et al. (26) | Intrapatient comparative study | 20 | Single dose CO2 + NB-UVB *versus* 2 treatments of CO2 + NB-UVB  Settings: 20W, 500 milliseconds pulse duration, 500 micrometers spacing, stack 2 (2.77 J/cm2) | 2 months | VASI | Mean change in VASI:  **1 dose**: -2.6%  **2 doses**: +14.4%  P = 0.11 | No adverse events reported. |
| Wen et al. (27) | Intrapatient comparative study | 21 | CO2 laser + tacrolimus + 308nm excimer laser *versus* tacrolimus + 308nm excimer  Settings: 3 sessions of pulse energy 100 mJ, spot density 100 spots/cm2, static mode, 2 passes | 6 months | 0, 1-25, 26-50, 51,-75, >75% | **Laser**: 2/21 >75%, 7/21 <25%  **Non-laser:** 2/21 >75%, 9/21 <25%  P > 0.05 | No adverse events reported. |

Abbreviations: 5-FU, Fluorouracil; AT, autologous transplantation; MN; CO2, carbon dioxide, M-K, melanocyte-keratinocyte; NB-UVB, narrowband UVB; PRP, platelet-rich plasma; VASI, vitiligo area severity index ER:YAG, Erbium:YAG; mJ, megaJoule; NB-UVB, narrowband UVB; PG, punch graft NCES, non-cultured epidermal cell suspension

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|  | **Table S5. Clinical trials using erbium-YAG (ER:YAG) laser ablative therapy for the treatment of vitiligo.** | | | | | | | |
|  | **Citation** | **Study design** | **N** | **Interventions** | **Follow-up** | **Outcome measures** | **Results** | **Adverse effects** |
| **Erbium-YAG (ER:YAG) laser** | Anbar et al. (28) | Intrapatient comparative study | 50 | ER:YAG+5-FU+ NB-UVB *versus* NB-UVB  Settings: spot size 3-5mm, fluence of 500-700mJ/cm2, twice weekly over 4 months | 4 months | <25, 25-75, >75% | **Laser:** 28/64 >75%, 14/64 <25%  **Non-laser:** 5/64 >75%, 50/64 <25%  Chi-squared P = 0.0001 | Pain in laser group; tolerable pain in all 5-FU. 50% of periungual lesions developed brown spots on nail plates. Hyperpigmentation in 30% of cases. |
| Doghaim et al. (29) | Intrapatient comparative study | 40 | ER:YAG + 5-FU + NB-UVB *versus* NB-UVB  Settings: spot size 3-5mm, frequence 5 Hz, DXP mode, fluence 2000-2250 mJ/cm2 | 4 months | <25, 25-50, 51-75, >75% | **Laser:** 12/40 >75%, 5/40 <25%  **Non-laser:** 0/40 >75%,10/40 <25%  Chi-squared P = 0.001 | Transient hyperpigmentation in most patients on laser side. Minimal scarring in 1 patient; no koebnerization. |
| Yan et al. (30) | Intrapatient (split body) comparative study | 22 | ER:YAG (600, 1200, or 1800 mJ) +betamethasone+ NB-UVB *versus* NB-UVB  Settings: fluences as above; 2 stacked passes, 130mm depth, medium pulse width | 3, 6 months | <25, 25–49, 50–74, ≥75% | **1800 mJ ER:YAG:** 5/22 >75%, 5/22 <25%  **Non-laser:** 0/22 >75%, 17/22 <25%  **Chi-squared P<0.0001** (1200 MJ vs. non-laser P = 0.01; 600 MJ vs. non-laser P = 0.30) | No adverse events reported (infection, scarring, Koebner, or worsening of vitiligo). All experienced slight pain during laser treatment, and erythema (<1 day). |
| Bayoumi et al. (31) | Intrapatient comparative study | 16 | ER:YAG + hydrocortisone + NB-UVB *versus* hydrocortisone + NB-UVB  Settings: fluence of 10 J/cm2, 3-10 passages until pinpoint bleeding | 1 month | 0, 1-24, 25-49, 50-74, ≥75% | **Laser:** 4/24 >75%, 11/24 <25%  **Non-laser:** 0/24 >75%, 22/24 <25%  P<0.001 (for >50% repigmentation [46% vs. 8% with and without laser]) | With laser: all had pain during treatment, delayed healing in 1 case, edema lasting 2-15 days on extremities, hypertrophic scars in 2 cases. |
| Abdelwahab et al. (32) | Intrapatient comparative study | 30 | 5-FU + ER:YAG + 5-FU *versus* 5-FU  Settings: spot size 4mm, fluence 60 J/cm2, 2-3 passes to achieve pinpoint bleeding | 3, 6 months | <25, 25–75, >75% | **Laser:** 0/30>75%, 22/30 <25%  **Non-laser:** 0/30 >75%, 30/30 <25%  P not reported | All patients experienced pain with 5-FU, itching/burning pain with laser; 6% had hyperpigmentation. |
| Mokhtari et al. (33) | Intrapatient comparative study | 18 | ER:YAG + 5-FU + clobetasol *versus* 5-FU + clobetasol  Settings: spot size 3mm, 200-500 mJ; until pinpoint bleeding achieved | 2,4 months | 0, 1-24, 25-50, >50%; and patch area | **Laser**: 24/38 <25%  **Non-laser**: 35/38 < 25%  Repeated-measures ANOVA P = 0.004 (reduction in mean size of patch over time) | Cellulitis in 1 patient in ER:YAG group. |
| Gupta et al. (34) | Parallel group comparative study | 32 | ER:YAG + MCT *versus* dermabrasion + NCES  Settings: pulse duration 250 microseconds, fluence of 5-10 J/cm2, 5-8 passes | 6 months | <30, 31-50, 51-80, >80% | **Laser**: 5/15 >75%, 4/15 <25%  **Non-laser**: 6/17 >75%, 7/17 <25%  Chi-squared P = 0.80 | 2 patients (both groups) developed hyperpigmentation, achromatic fissures after ER:YAG in 1 case, scaring after dermabrasion in 1 case. |
| Pai et al. (35) | Non-randomized, parallel group comparative study | 29 | ER:YAG laser + PG *versus* PG *versus* ER:YAG + SBG *versus* SBG  Settings: 2.25mm spot size, 1000 mJ/pulse, 10 Hz, 10-12 passes until pinpoint bleeding achieved | Not reported | <50, 50-75, >75%; mean patch area | **ER:YAG + PG:** 11/16 (69%) <75%  **PG**: 4/8 (50%) >75%  **ER:YAG + SBG**: 0/3 >75%  **SBG**: 0/5 >75%  P not reported | Depigmentation in 2 punch grafts. |

Abbreviations: 5-FU, Fluorouracil; AT, autologous transplantation; MN; CO2, carbon dioxide, M-K, melanocyte-keratinocyte; NB-UVB, narrowband UVB; PRP, platelet-rich plasma; VASI, vitiligo area severity index ER:YAG, Erbium:YAG; mJ, megaJoule; NB-UVB, narrowband UVB; PG, punch graft NCES, non-cultured epidermal cell suspension

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|  | **Table S6. Clinical trials using dermabrasion ablative therapy for the treatment of vitiligo.** | | | | | | | |
| **Dermabrasion** | **Citation** | **Study design** | **N** | **Interventions** | **Follow-up** | **Outcome measures** | **Results** | **Adverse effects** |
| Farajzadeh et al. (36) | Intrapatient single-blinded placebo-controlled study | 60 | Pimecrolimus cream + dermabrasion *versus* pimecrolimus cream *versus* placebo | 3 months | <25, 25-49, 50-74, 75-99, 100% | **Dermabrasion+Cream**: 26/60 >75%, 11/60 <25%  **Cream:** 13/60 >75%, 29/60 < 25%  **Placebo**: 1/60 >75%, 59/60 <25%  P<0.0001 at 3 months (also significant at 1 and 2 months) | Mild burning with dermabrasion in 30% of patients. |
| Sethi et al. (37) | Intrapatient comparative controlled study | 30 | Dermabrasion *versus* dermabrasion + placentrex *versus* dermabrasion + 5-FU | 6 months | <25, 25-49, 50-75, >75% | Number achieving >75% or <25% not reported; no significant differences between groups achieving >50% | *Depigmentation*: 4 with dermabrasion alone, 3 with dermabrasion + 5-FU, and 4 with dermabrasion + placentrex.  *Hypertrophic scaring:* 3 with dermabrasion alone, 4 with 5-FU, 1 with placentrex. *Hyperpigmentation:* 26 with dermabrasion alone, 27 with 5-FU, 26 with placentrex |
| Kumar et al. (38) | Open label intrapatient comparative study | 15 | Manual dermabrasion + NCES *versus* electrofulguration-dermabrasion + NCES | 6 months | <26, 26-50, 51-75, 76-90, >90% | **Manual+NCES**: 9/15 >75%, 0<25%  **Electrofulguration+NCES**: 10/15 >75%, 0<25%  No significant differences. | Hyperpigmentation at donor site (1/15); peri-graft halo in 6 with electro-dermabrasion and 5 with manual dermabrasion. |
| Quezada et al. (39) | Intrapatient comparative study | 11 | Dermabrasion + M-K transplantation *versus* dermabrasion only | 3 months | Repigmentation area % quantified using Corel Draw X4 program17 | No significant differences | Erythema. |

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|  | **Table S7. Clinical trials using punch grafting for the treatment of vitiligo.** | | | | | | | |
| **Punch grafting (PG)** | **Citation** | **Study design** | **N** | **Interventions** | **Follow-up** | **Repigmentation measures** | **% Repigmentation** | **Adverse effects** |
| Komen et al. (40) | Intrapatient comparative study | 30 | 1.5mm deep PG  *versus* 1.5mm superficial PG  *versus* 1mm deep PG  *versus* 1mm superficial PG | 6 months | Pigment surface area | 1.5mm had significantly larger pigmented surface area (P<0.001); no difference between punch depths | 1.5mm deep grafts had more recipient site hyperpigmentation and cobblestone formation, and donor site hypopigmentation. |
| Mohamed et al. (41) | Intrapatient comparative study | 32 | Punch graft  *versus* hair follicle graft | 6 months | <25, 25-50, 51-75, >75% | **PG**: 13/32 >75%, 3/32 <25%  **Follicle graft**: 5/32 >75%, 19/32 <25%  P<0.0001 | Punch graft: cobblestone appearance (90%); Follicle graft: no side effects. |
| Saldanha et al. (42) | Non-randomized intrapatient comparative trial | 11 | Mometasone + punch graft  *versus* punch graft | 6 months | Internal area (mm2) | Repigmentation halo larger with mometasone (26 vs. 14 mm2)  P = 0.03 | Not reported. |
| Sharma et al. (43) | Intrapatient comparative trial | 20 | Flip-top transplantation (FTT) *versus* punch grafting (PG) | 6 months | <30, 31-50, 51-75, 76-90, 91-100% | **PG**: 10/20 >90%, 16/20 >75%, 3/20 <30%  **FTT**: 13/20>90%, 16/20 >75%, 2/20 <30%  Mann-Whitney P = 0.44 | Cobble-stoning (15% FTT vs. 35% PG group), hyperpigmentation (5% in FTT and PG), variegated appearance (10% FTT vs. 0% PG) |
| Khandpur et al. (44) | Parallel-group comparative study | 64 | Minipunch graft + PUVA  *versus* split-skin grafting + PUVA | 3 months | <30, 31-50, 51-75, >75% | **Minipunch graft**: 15/34 >75%  **Split skin grafting**: 25/30 >75%  P < 0.05 | Split thickness grafts: 4 achromic fissuring (13%), 4 graft contracture (3%), 7 graft rejection (5%) in one case; tire-pattern appearance in two patients (7%); milia formation in four (13%); depigmentation of the grafts in two (7%) cases. |
| Linthorst et al. (45) | Intrapatient patient comparative study | 14 | PG + 308nm laser *versus* PG + NB-UVB | 3 months | Repigmentation area using digital image analysis | **PG + NB-UVB**: 3/14 >75%  **PG + laser:** 2/14 >75%  No significant differences. | Not reported. |
| Mapar et al. (46) | Intrapatient (split patch) comparative study | 25 | PG *versus* follicular hair transplantation + NB-UVB | 1-6 months | Mean diameter of repigmentation in mm | After 1 month:  **PG**=1.6 vs **FG**=2 (P=0.03)  After 6 months:  **PG**= 5.3 vs. **FG** 5 (P=0.18) | Not reported. |
| Sheth et al. (47) | Intrapatient comparative trial | 10 | Minigraft + NB-UVB *versus* minigraft + 308nm monochromatic excimer | 3 months | % repigmentation based on baseline and week-12 images | **Minigraft+NB-UVB**: 1/10  >75%  **Minigraft+laser**: 2/10 >75%  No significant differences. | Not reported. |

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|  | **Table S8. Clinical trials using suction blister epidermal grafting for the treatment of vitiligo.** | | | | | | | |
| **Suction blister epithelial grafting (SBEG)** | **Citation** | **Study design** | **N** | **Interventions** | **Follow-up** | **Repigmentation measures** | **% Repigmentation** | **Adverse effects** |
| Ozdemir et al. (48) | Intrapatient comparative trial | 20 | SBEG *versus* split-thickness graft | 3 months | Yes/No repigmentation (by 1 nonblinded + 2 blinded observers) | **SBEG**: 45% of patients had repigmentation.  **Split-thickness graft**: 90% of patients had repigmentation.  Mann-Whitney P<0.001 | **Donor area**: Koebner phenomenon (9/20 SBEG, 10/20 ST), hypopigmentation (13/20 SBEG, 1/20 ST), hyperpigmentation (3/20 SBEG only), scarring (7/20 ST), infection (3/20 ST); **Recipient area**: Milium (4/20 ST), Pigment loss (3/20 both), papules (2/20 SBEG, 8/20 ST), scarring (1/20 ST), infection (2/20 both). |
| Babu et al. (49) | Parallel group comparative trial | 18 | SBEG *versus* PG | 6 months | <30, 30-50, 51-75, 76-90, >90% | **PSG**: 4/8 > 75%,  **SBEG**: 5/10 >75%  Not significantly different | PSG: cobblestone appearance; SBEG: patchy pigmentation and hyperpigmentation. |
| Ding et al. (50) | Intrapatient (split lesion) comparative trial | 23 | SBEG + NB-UVB  *versus* MPG + NB-UVB | 3 months | Multiple | Repigmentation rates not statistically different | 2/23 scarring at recipient site with MPG (did not subside), cobblestone appearance with SBEG, hyperpigmentation in all donor sites with SBEG. |
| Ezz-Eldawla et al. (51) | Block-randomized parallel-group trial | 30 | SBEG  *versus* MPG  *versus* HFT | 3 months | 0-25, 26-50, 51-75, >75% | **SBEG**: 9/10> 75%, 0/10 <25%  **MPG**: 2/10>75%, 2/10 <25%  **HFT**: 0/10 <75%, 8/10 <25%  Chi-squared P < 0.001 (for all comparisons) | Cobble-stoning in mini punch (40%), hair follicle rejection (40%), SBEG hyperpigmentation (10%). |

Abbreviations: PG, punch grafting; HFT; hair follicle transplant; MPG, mini punch grafting; NB-UVB, narrowband UVB; SBEG, suction blister epidermal grafting; FTT, flip-top transplantation; PUVA, psoralen plus UVA; BG, blister grafting; CES, cultured epidermal cell suspension; VPSS, visual pigmentation scoring scale.

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|  | **Table S9. Clinical trials using non-cultured and cultured cell transplantation for the treatment of vitiligo.** | | | | | | | |
| **Non-cultured and cultured cell transplantation** | **Citation** | **Study design** | **N** | **Interventions** | **Follow-up** | **Repigmentation measures** | **% Repigmentation** | **Adverse effects** |
| Awasti et al. (52) | Parallel group comparative study | 30 | NCES with cold  *versus* warm trypsinization | 4 months | 0-90, >90% | **Cold NCES**: 19/22 achieved >90%  **Hot NCES**: 11/20 achieved >90%  P = 0.04 | Not reported. |
| Back et al. (53) | Intrapatient placebo-controlled study | 13 | Keratinocyte/melanocyte suspension  *versus* placebo | 12, 24, and 52 weeks | VPSS; Time to repigmentation | At 52 weeks, 0% achieved “marked repigmentation” in all groups (P not reported); No difference in time to repigmentation (P = 0.76) | Loss of pigmentation in 10/13 of the previously normo-pigmented donor areas. |
| Bao et al. (54) | Intrapatient comparative study | 83 | BG  *versus* CMT v *versus* NCESs | 12 months | <20%, 20-49, 50-89, ≥ 90% | **BG**: 63/83 ≥90%, 3/83<20%  **CMT**: 46/83 ≥90%, 6/83<20%  **NCES**: 44/83≥90%, 7/83<20% | Transient hyperpigmentation in 22/83 of BG group; 0 in other groups. |
| Budainia et al.(55) | Intrapatient comparative study | 41 | NCES  *versus* SBEG | 4 months | <50, 50-74, 75-90, >90% | **NCES**: 25/41 >75%, 2/41<50%.  **SBEG**: 22/41 >75%, 1/41 <50%. | No adverse events. |
| Donaparthi et al. (56) | Non-randomized, parallel group comparative study | 11 | EMT  *versus* HFMT | 6 months | <26%, 26-50, 51-75, >75% | >75% in 90% of patches in **EMT** vs. 43.3% of patches of **HFMT** group (<25% numbers not reported). | Peri-graft halo in EMT; color mismatch in HFMT. |
| Ebadi et al. (57) | Non-randomized intrapatient comparative study | 10 | Excimer versus non-cultured MKT  *versus* excimer + non-cultured MKT  *versus* control | 2 weeks | 0-24, 25-64, 65-94, >94%; % reduction in depigmented area | Greater % reduction in **combination group** (41.9%) than in **MKT** (15.9%) or **control** (0.1%) | Not reported. |
| Esmat et al. (58) | Intrapatient comparative study | 18 | MKT with Ham F12 medium (A)  *versus* bFGF + cAMP medium (B) | 6 months | 0-9, 10-24, 25-49, 50-74, 75-89, 90-100%: | 5/9 > 90% in **group A**  7/9 > 90% in **group B**  P=0.028 | Marginal halo in 5 cases in group A and 6 in group B; infection in 2 cases in group A. |
| Feily et al. (17) | Intrapatient comparative study | 20 | CO2 + AT + NB-UVB  *versus* AT + NB-UVB  Settings: 1 session of pulse energy of 100 mJ/cm2, spot density of 200 in static mode | 3 months | Diameter of repigmentation around graft | Mean change in diameter (mm) was 6.6 (SD 5.8) with laser versus 4.3 (SD 1.8) without laser (P < 0.001) | Not reported. |
| Hamza et al. (59) | Parallel group comparative study | 20 | Non-cultured extracted hair follicle outer root sheath cell suspension (NCORSHFS) *versus* non-cultured epidermal cell suspension (NCES) | 3 months | <50%, 50-74%, 75-89%, 90-100% | **NCES**: 20% (2/10) >75%:  **HFS** 30% (3/10) >75%  No significant difference | No complications in NCORSHFS. In NCES, mild scarring of donor area (40%) and hyperpigmentation (20%). |
| Mrigpuri et al. (60) | Intrapatient comparative study | 30 | Four-compartment method NCES  *versus* conventional lab NCES | 4 months | ≤25, 26–50%, 51–75%, 76–90, >90% | **Four-compartment**: 28/41 >75%,  **Conventional NCES**: 29/41 >75%  No significant difference | 1 infection in four-compartment NCES group. |
| Pangti et al. (61) | Intrapatient comparative study | 10 | NCES *versus* EHF *versus* PHS | 36 weeks | % of skin repigmentation | Repigmentation significantly worse in PHS vs. NCES; no differences in EHF vs. NCES | Not reported. |
| Razmi et al. (62) | Intrapatient (paired lesions) comparative study | 30 | ECS + FCS *versus* ECS | 2, 4 months | < 50%, 50-74, 75-90, >90% | At 2 months:  **ECS+FCS**: 32/42 (76%) >75%  **ECS**: 24/42 (57%) >75%  P < 0.001  At 4 months:  **ECS+FCS**: 20/42 (48%) >75%  **ECS**: 13/42 (31%) >75%  P = 0.001 | 7 patients had hyperpigmentation at the donor site. |
| Sahni et al. (63) | Parallel group comparative study | 25 | Melanocyte transplantation via PRP (A) *versus* via serum (B) | 4 months | <26, 26-50, 51-75, 86-90, >90% | **Transplant with saline**: 9/14 >75%  **Transplant with serum:** 13/14 >75%  P=0.09 | **Saline:** halo phenomenon (1), infection (1), hyperpigmentation (5), scarring at donor site (2)  **Serum**: halo (2), infection (2), hyperpigmentation (3). |
| Singh et al. (64) | Parallel group comparative study | 30 | NCES *versus* NCORSHFS | 4 months | <50, 50-74, 75-90, >90% | **NCES**: 20/24 > 90%, 22/24 >75%  **NCORSHFS**: 15/23 > 90 %, 18/23 >75%  P = 0.15 and 0.43 for achieving >90% and >75% respectively | Reported no complications. |
| Thakur et al. (65) | Block-stratified parallel-group comparative study | 40 | NCES + NDCS *versus* NCES alone | 6 months | <25, 25-50, 51-75%, 76-90, >90 | Disease stability 3-6 months:  **NCES alone**: 3/10 >75%  **NCES +NDCS**: 10/10 >75%  P = 0.002  Disease stability >12 months:  **NCES alone**: 6/10 >75%  **NCES +NDCS**: 7/10 >75%  P=0.29  0% of patients had <25% repigmentation | Infection: 1/10 in NCES group; hyper/hypopigmentation at donor site: 1/10 in NCES, 1/10 in combined. |
| Verma et al. (66) | Intrapatient comparative study | 27 | CMT *versus* NCES | 3-6 months | < 25, 26-50, 51-75, >75% | At 3 months:  **CMT**: 19/27 >75%, 0/27 <25%  **NCES**: 2/27 >75% 12/27 <25%  Fisher P < 0.0001 | Not reported. |
| Verma et al. (67) | Intrapatient comparative study | 25 | NMCT *versus* CMT | 6 months | <30, 30-70, >70% | **NCMT**: 31/50 >70%, 9/50 <30%  **CMT**: 26/50 >70%, 19/30 <30%  P=0.058 | Infection in 1 NCMT site and 5 CMT sites (resolving with antibiotics and no scarring). |
| Redondo et al. (68) | Intrapatient comparative study | 24 | CES *versus* AM-CEG *versus* control | 3, 6 months | % of skin repigmentation | At 6 months, mean (SD):  **CES**: 43.4 (38.3)  **AM-CEG**: 38.9 (38.7)  **Control**: 27.9 (34.5)  P = 0.81 | 1 case each of inflammation, minimal scarring, and delayed wound healing (not reported by group). |
| Li et al. (69) | Parallel group comparative study | 28 | Feeder culture epithelial sheets *versus* no feeder culture epithelial sheets | 12 months | <25, 25-50, 51-75%, >75% | **Feeder free**: 9/14 >75%, 3/14 <25%  **Feeder**: 8/14 >75%, 1/14 <25%  No significant difference | Scarring at the donor sites. |
| Zhang et al. (70) | Parallel group comparative study | 473 | Group 1: 20 NB-UVB sessions before transplantation; Group 2: 30 NB-UVB sessions after transplantation; Group 3: 20 NB-UVB before and 30 after transplantation; Group 4: transplant only | 6 months | <20, 20-49, 50-89, ≥90% | **Group 1**: 74/108 (59%) ≥90%  **Group 2**: 70/113 (62%) ≥90%  **Group 3**: 94/116 (81%) ≥90%  **Group 4**: 48/110 (44%) ≥90%  Chi-squared P < 0.001 (across all groups, although no statistical difference between group 1 and group 2) | Erythema, burning, pruritus, xerosis. |
| Thakur et al. (71) | Parallel group comparative study | 30 | Non-cultured FCS via follicular unit extraction *versus* plucking | 4 months | <25, 25-75, >75% | **Extraction FCS**: 3/15 >75%, 1/15 <25%  **Plucking FCS**: 0/15 >75%, 8/15 <25%  Fisher exact P = 0.22 and 0.01 for achieving >75% and <25% respectively | No patient in either group developed donor or recipient site complications like infection, koebnerization, visible scarring or milia. |
| Vashisht et al. (72) | Double-blind intrapatient comparative study | 22 | HFT with trypsin (A) versus with trypsin + collagenase (B) *versus* control (C) (all patches received dermabrasion) | 6 months | % repigmentation by photography and sheet tracings | Mean % repigmentation: 33.2% in **A group** vs. 24 % in **B group** vs. 17% in **C group**.  P = 0.13 | Not reported. |
|  | Anbar et al. (73) | Prospective, randomized parallel-group trial | 40 | NCES grafting from suction blister roofs *versus* partial‐thickness epidermal cuts | 4 months | 0, 1-25, 26-50, 51-75, 76-90, 91-99, 100% | **Suction blister**: 18/20 >75%, 2/20 < 25%  **Partial thickness epidermal cuts**: 20/20 >75%, 0/20 <25%  1-way ANOVA P =0.3 | Suction blister: hyperpigmentation in all (20) patients, resolved.  Partial thickness epidermal cuts: hyperpigmentation (2/20), dyspigmentation (12/20), hypertrophic scarring (4/20). |

Abbreviations: AT: autologous transplantation; AM-CEG, amniotic-membrane cultured epidermal cell grafting; CES, cultured epidermal cell suspension; CMT, cultured melanocyte transplant; EMT, epidermal melanocyte transfer; HFT, hair-follicle transplant; FCS, hair follicular cell suspension; NCES, non-cultured epidermal cell suspension; NCORSHFS, non-cultured extracted hair follicle outer root sheath cell suspension; NDCS, non-cultured dermal cell suspension; MKT, melanocyte-keratinocyte transplant; SBEG, suction-blister epidermal grafting; VPSS, visual pigmentation scoring scale

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| **Table S10**. Risk of bias assessment for studies of platelet-rich plasma therapies for vitiligo. | | | | | | | |
| **Title** | **Random sequence generation** | **Allocation concealment** | **Blinding of participants and personnel** | **Blinding of outcome assessment** | **Incomplete outcome data** | **Selective reporting** | **Other** |
| (1) | 1 | 3 | 3 | 1 | 1 | 1 | 3 |
| (4) | 1 | 3 | 3 | 1 | 1 | 1 | 3 |
| (3) | 1 | 3 | 3 | 3 | 1 | 1 | 3 |
| (2) | 1 | 3 | 3 | 1 | 1 | 1 | 3 |
| (5) | 1 | 1 | 1 | 1 | 1 | 1 | 3 |

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| **Table S11**. Risk of bias assessment for studies of microneedling therapies for vitiligo. | | | | | | | |
| **Title** | **Random sequence generation** | **Allocation concealment** | **Blinding of participants and personnel** | **Blinding of outcome assessment** | **Incomplete outcome data** | **Selective reporting** | **Other** |
| (8) | 1 | 3 | 3 | 3 | 1 | 1 | 3 |
| (6) | 1 | 3 | 3 | 3 | 1 | 1 | 3 |
| (7) | 1 | 3 | 2 | 3 | 1 | 1 | 3 |
| (9) | 1 | 3 | 3 | 3 | 1 | 1 | 3 |
| (11) | 3 | 3 | 3 | 3 | 1 | 1 | 3 |
| (10) | 1 | 3 | 3 | 2 | 1 | 3 | 3 |

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| **Table S12**. Risk of bias assessment for studies of ablative therapies for vitiligo. | | | | | | | |
| **Title** | **Random sequence generation** | **Allocation concealment** | **Blinding of participants and personnel** | **Blinding of outcome assessment** | **Incomplete outcome data** | **Selective reporting** | **Other** |
| (18) | 1 | 3 | 3 | 1 | 3 | 1 | 3 |
| (27) | 1 | 3 | 3 | 1 | 1 | 1 | 3 |
| (12) | 1 | 3 | 3 | 1 | 2 | 2 | 3 |
| (34) | 1 | 1 | 3 | 3 | 1 | 3 | 3 |
| (22) | 1 | 3 | 3 | 1 | 1 | 1 | 3 |
| (25) | 3 | 3 | 3 | 1 | 1 | 1 | 3 |
| (13) | 1 | 1 | 3 | 1 | 1 | 1 | 3 |
| (19) | 1 | 3 | 3 | 1 | 1 | 1 | 3 |
| (37) | 3 | 3 | 3 | 3 | 1 | 1 | 3 |
| (38) | 3 | 2 | 2 | 3 | 1 | 1 | 3 |
| (31) | 1 | 3 | 2 | 1 | 1 | 1 | 3 |
| (26) | 3 | 3 | 3 | 3 | 1 | 1 | 3 |
| (28) | 1 | 3 | 3 | 3 | 1 | 1 | 3 |
| (23) | 2 | 2 | 3 | 3 | 2 | 1 | 3 |
| (32) | 1 | 3 | 3 | 3 | 1 | 1 | 3 |
| (16) | 1 | 3 | 2 | 1 | 1 | 1 | 3 |
| (35) | 2 | 3 | 3 | 3 | 2 | 1 | 3 |
| (14) | 1 | 3 | 3 | 1 | 1 | 1 | 3 |
| (17) | 1 | 3 | 3 | 3 | 1 | 1 | 3 |
| (30) | 3 | 3 | 2 | 1 | 1 | 1 | 3 |
| (39) | 3 | 3 | 3 | 3 | 1 | 1 | 3 |
| (15) | 1 | 3 | 2 | 2 | 1 | 1 | 3 |
| (33) | 1 | 3 | 3 | 1 | 1 | 1 | 3 |
| (20) | 1 | 3 | 3 | 3 | 1 | 1 | 3 |
| (29) | 1 | 3 | 2 | 1 | 1 | 1 | 3 |
| (21) | 1 | 3 | 2 | 3 | 1 | 1 | 3 |
| (36) | 1 | 3 | 3 | 1 | 3 | 1 | 3 |
| (24) | 1 | 3 | 3 | 1 | 1 | 1 | 3 |

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| **Table S13**. Risk of bias assessment for studies of surgical therapies for vitiligo. | | | | | | | |
| **Title** | **Random sequence generation** | **Allocation concealment** | **Blinding of participants and personnel** | **Blinding of outcome assessment** | **Incomplete outcome data** | **Selective reporting** | **Other** |
| (51) | 1 | 3 | 3 | 3 | 1 | 1 | 3 |
| (67) | 1 | 3 | 2 | 2 | 1 | 1 | 3 |
| (46) | 1 | 3 | 2 | 2 | 1 | 1 | 3 |
| (45) | 1 | 3 | 3 | 1 | 1 | 1 | 3 |
| (70) | 1 | 3 | 3 | 1 | 1 | 1 | 3 |
| (72) | 1 | 1 | 1 | 1 | 1 | 1 | 3 |
| (50) | 1 | 3 | 2 | 3 | 1 | 1 | 3 |
| (42) | 2 | 2 | 2 | 2 | 1 | 1 | 3 |
| (63) | 1 | 3 | 3 | 3 | 1 | 1 | 3 |
| (54) | 2 | 3 | 2 | 3 | 1 | 1 | 3 |
| (69) | 1 | 3 | 2 | 2 | 1 | 1 | 3 |
| (62) | 1 | 1 | 1 | 1 | 1 | 1 | 3 |
| (56) | 2 | 2 | 2 | 2 | 1 | 1 | 3 |
| (43) | 2 | 2 | 2 | 3 | 1 | 1 | 3 |
| (55) | 1 | 3 | 3 | 3 | 1 | 1 | 3 |
| (64) | 1 | 3 | 3 | 3 | 1 | 1 | 3 |
| (61) | 1 | 3 | 3 | 3 | 1 | 1 | 3 |
| (52) | 1 | 3 | 3 | 3 | 1 | 1 | 3 |
| (71) | 1 | 3 | 3 | 3 | 1 | 1 | 3 |
| (44) | 1 | 3 | 3 | 2 | 1 | 1 | 3 |
| (48) | 3 | 3 | 3 | 2 | 1 | 1 | 2 |
| (68) | 1 | 1 | 1 | 1 | 3 | 1 | 3 |
| (47) | 3 | 3 | 3 | 1 | 3 | 1 | 3 |
| (65) | 1 | 3 | 1 | 1 | 1 | 1 | 3 |
| (66) | 3 | 3 | 3 | 3 | 2 | 1 | 3 |
| (60) | 1 | 3 | 1 | 1 | 1 | 1 | 3 |
| (73) | 1 | 3 | 2 | 3 | 1 | 1 | 3 |
| (59) | 1 | 1 | 3 | 3 | 1 | 1 | 3 |
| (53) | 1 | 1 | 1 | 1 | 1 | 1 | 3 |
| (40) | 1 | 1 | 3 | 1 | 1 | 1 | 3 |
| (41) | 3 | 3 | 3 | 3 | 1 | 1 | 3 |
| (49) | 1 | 3 | 2 | 3 | 1 | 1 | 3 |
| (58) | 1 | 1 | 3 | 1 | 1 | 1 | 3 |
| (57) | 2 | 3 | 3 | 2 | 1 | 1 | 3 |

**Supplemental Figures**

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| **Study** | **Weight (%)** | **Odds Ratio (<25% Repigmentation)** | **P-value** |
| **Combined** | **100** | **0.24 (0.11-0.52)** | **0.0003** |
| (8) | 67.21 | 0.33 (0.13-0.81) | 0.0159 |
| (9) | 32.79 | 0.05 (0.00-0.47) | 0.0085 |

**Figure S1. Forest plots of odds ratios for studies combining microneedling with NB-UVB.** Error bars represent 95% confidence intervals. Q=0.276; p=0.599; I2=0.

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| **Study** | **Weight (%)** | **Odds Ratio (>75% Repigmentation)** | **P-value** | **Odds Ratio (<25% Repigmentation)** | **P-value** |
| **Combined** | **100** | **2.60 (1.05-6.45)** | **0.039278** | **0.43 (0.25-0.72)** | **0.001585** |
| (19) | 19.88 | 21.00 (1.15-383.99) | 0.039707 | 0.24 (0.07-0.85) | 0.026410 |
| (15) | 18.63 | 4.21 (0.18-97.55) | 0.375911 | 0.12 (0.02-0.62) | 0.011086 |
| (18) | 16.15 | 2.08 (0.18-24.51) | 0.571132 | 0.46 (0.20-1.06) | 0.009799 |
| (16) | 7.45 | 0.70 (0.13-3.68) | 0.686905 | 0.70 (0.13-3.68) | 0.686905 |
| (14) | 31.68 | 0.50 (0.02-15.09) | 0.699916 | 1.93 (0.69-5.40) | 0.209746 |
| (13) | 6.21 | 2.11 (0.06-70.98) | 0.690082 | 0.12 (0.01-2.71) | 0.181757 |

Diagram

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**Figure S2. Forest plots of odds ratios for studies combining CO2 with NB-UVB.** Error bars represent 95% confidence intervals. For >75% repigmentation,Q=5.43; p=0.366; I2=7.88. For <25% repigmentation, Q=3.26; p=0.660; I2=0.

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| **Study** | **Weight (%)** | **Odds Ratio (>75% Repigmentation)** | **P-value** | **Odds Ratio (<25% Repigmentation)** | **P-value** |
| **Combined** | **100** | **14.07 (5.42-36.55)** | **0.000000** | **0.15 (0.08-0.27)** | **0.000000** |
| (28) | 26.67 | 33.86 (1.92-597.23) | 0.016064 | 0.43 (0.13-1.39) | 0.159601 |
| (31) | 14.67 | 12.65 (0.64-247.98) | 0.094412 | 0.09 (0.02-0.35) | 0.000708 |
| (30) | 16.00 | 9.4 (0.47-188.78) | 0.143518 | *Not reported* | |
| (29) | 42.67 | 9.18 (3.25-25.91) | 0.000034 | 0.08 (0.03-0.18) | 0.000000 |

Chart, box and whisker chart

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**Figure S3. Forest plots of odds ratios for studies combining ER:YAG with NB-UVB.** Error bars represent 95% confidence intervals. For >75% repigmentation,Q=3.59; p=0.309; I2=16.40. For <25% repigmentation, Q=2.13; p=0.345; I2=6.07.

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| **Study** | **Weight (%)** | **Odds Ratio (>75% Repigmentation)** | **P-value** |
| **Combined** | **100** | **0.21 (0.05-0.84)** | **0.02723** |
| (49) | 47.37 | 1.00 (0.16-6.42) | 1 |
| (51) | 52.63 | 0.03 (0.00-0.37) | 0.00656 |

**Figure S4. Forest plots of odds ratios for studies comparing SBEG versus PG.** Error bars represent 95% confidence intervals. Q=1.90; p=0.168; I2=47.40.

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