Updates in Procedural Interventions for Hair Loss in 2025

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Disclosures

- Abbvie
- Bristol Myers Squibb
- Castle Biosciences
- Dermavant Sciences
- DermTech
- Galderma
- Incyte
- Journey
- LEO Pharma
- Lilly
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American University of the Caribbean
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Mariam Sobh, MS
American University of the Caribbean
School of Medicine

Narrow-Band UVB

AA LPP

NB-UVB

- MOA:
  - Increased transcription of growth factors via Photobiomodulation
  - Effect on cellular metabolism (i.e. mitochondria)
  - Anti-inflammatory
- Adverse Effects:
  - Rare mild dry skin, irritation, scalp tenderness, paresthesia, urticaria
- Skin Cancer risk?
  - Very low/none

AA

NB-UVB

- Taieb et al. RCT on 60 patients with scalp AA randomized into four groups: (1) topical calcipotriol, **(2) NB-UVB**, (3) both and (4) placebo.
- N=60
- **NB-UVB 2x/wk for 3 months**
  - UVB lamp (TL01) of Waldman-type F 85/100W-01 (Waldman, Villingen- Schwenningen, Germany)
  - UVB lamp (TL01) of Waldman-type F 85/100W-01 (Waldman, Villingen-Schwenningen, Germany)
- Significant improvement in SALT scores after NB-UVB
- **Combination of calcipotriol and NB-UVB is not superior to each line of treatment alone**

	Group I (No. = 15)	Group II (No. = 15)	Group III (No. = 15)	Group IV (No. = 15)	*P* value*
SALT score					0.976
Before treatment					
	4.01 ± 1.1	3.97 ± 0.7	4.27 ± 1.0	3.50 ± 0.9	
P value**	*P*1 = 0.977	*P*3 = 0.831	*P*5 = 0.651	*P*6 = 0.750	
	*P*2 = 0.854	*P*4 = 0.775			
After treatment					0.029
	2.84 ± 1.0	2.33 ± 0.7	1.73 ± 0.5	4.14 ± 1.0	
P value**	*P*1 = 0.891	*P*3 = 0.643	*P*5 = 0.025	*P*6 = 0.041	
	*P*2 = 0.530	*P*4 = 0.037			
P value***	0.026	0.005	0.004	0.140	

G I = topical calcipotriol, G II = NB-UVB, G III = both and G IV = placebo

*P*1 (G I vs G II), *P*2 (G I vs G III), *P*3 (G II vs G III), *P*4 (G II vs G VI), *P*5 (G III vs G VI), and *P*6 (G I vs G VI)

Randomized Controlled Trial > Arch Dermatol Res. 2019 Oct;311(8):629-636.
doi: 10.1007/s00403-019-01943-8. Epub 2019 Jun 24.

Topical calcipotriol vs narrowband ultraviolet B in treatment of alopecia areata: a randomized-controlled trial

Moustafa A El Taieb [1], Eisa M Hegazy [2], Hassan M Ibrahim [2], Asmaa B Osman [3], Manal Abualhamd [4]

LPP

NB-UVB

- Prospective pilot study of **NB-UVB monotherapy for LPP**
- Inclusion Criteria:
  - Age >= 18 yrs (mean 56.3 +/- 11.0)
  - Bx-proven LPP
  - Baseline LPPAI score >2.0
- N = 16 (13 F, 3 M)
- Target area w/ greatest degree of clinical inflammation tattooed
- NB-UVB fiber-optic brush (300-320 nm) – Levia LiteBrush (Daavlin Company) – 3x/wk for 6 months
- Statistically significant reduction in scalp inflammation
- 56.3% reported improvement in scalp pruritus
- Mild, transient scalp redness post-Tx

Table I. Outcomes of patients with lichen planopilaris treated with narrowband UV-B*

Category	Pretreatment (mo 0)	Posttreatment (mo 6)	Mean change	*P* value
Clinical assessments, mean ± SD (Δ%)				
LPPAI score	2.3 ± 1.5	1.06 ± 0.6	−1.3 ± 1.3 (−45%)	.01†
Target area scale†	1.4 ± 1.0	0.9 ± 0.7	−0.5 ± 0.8 (−21%)	.03†
Target area erythema†	1.8 ± 1.1	0.7 ± 0.9	−1.1 ± 1.1 (−46%)	<.01†
Trichologic assessment, mean ± SD				
Hair density	141.9 ± 47.2	137.6 ± 52.2	−4.31 ± 14.7	.26
Hair diameter	74.5 ± 25.0	74.7 ± 29.3	0.22 ± 11.2	.94

Superficial Cryotherapy

AA

Superficial Cryotherapy

- Hypothesized MOA:
  - Immunomodulation
  - Reactive vasodilation after the immediate initial vasoconstrictive response and improve microcirculation in hair follicles leading to increased hair growth
- Effect of cryotherapy for the treatment of AA first examined in 1991- 97% of patients with mild AA demonstrated a therapeutic response
- Numerous studies reporting 55-80% hair regrowth
- Success in recalcitrant AA
- Some studies compared to ILK and saw comparable results
- Pros: cheap, can be easily implemented
- Cons: no payor coverage for CPT code

Review > J Drugs Dermatol. 2023 Aug 1;22(8):802-809. doi: 10.36849/jdd.7431.

Review of Superficial Cryotherapy for the Treatment of Alopecia Areata

Michael Kaiser, Najy Issa, Marita Yaghi, Joaquin J Jimenez, Naiem T Issa

PMID: 37556514 DOI: 10.36849/jdd.7431

Low Leve Light Therapy (LLLT)

AGA | AA | LPP

LLLT (red and near-IR 600-1070nm)

- Hypothesized MOA:
  - Increased transcription of growth factors via Photobiomodulation
  - Effect on cellular metabolism (i.e. mitochondria)
  - Anti-inflammatory
- Adverse Effects:
  - Rare mild dry skin, irritation, scalp tenderness, paresthesia, urticaria
- AGA:
  - Has FDA approval*
  - Double-Blind, Sham-controlled, randomized trials performed
- AA:
  - Case reports & series
- LPP:
  - Case reports & Series

RESEARCH LETTER · Volume 78, Issue 5, P1020-1023, May 2018 Download Full Issue

Effectiveness of low-level laser therapy in lichen planopilaris

Pablo Fonda-Pascual, MD · Oscar M. Moreno-Arrones, MD · David Saceda-Corralo, MD · ... · Cristina Pindado-Ortega, MD · Pablo Boixeda, MD, PhD · Sergio Vaño-Galvan, MD, PhD... Show more

Affiliations & Notes · Article Info

Home › Dermatology and Therapy › Article

Lichen Planopilaris and Low-Level Light Therapy: Four Case Reports and Review of the Literature About Low-Level Light Therapy and Lichenoid Dermatosis

Dermatology and Therapy

AGA

LLLT (red and near-IR 600-1070nm)

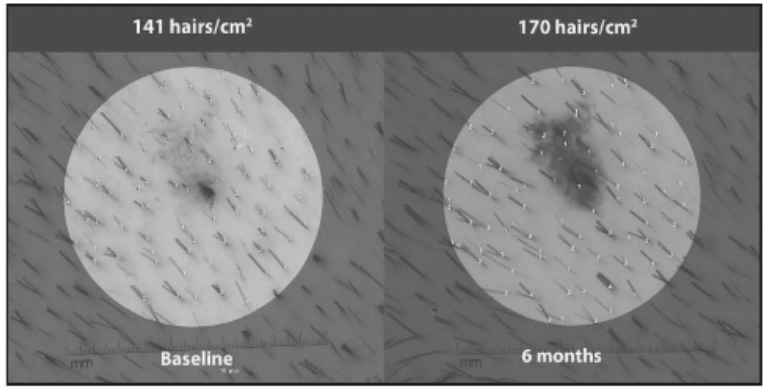


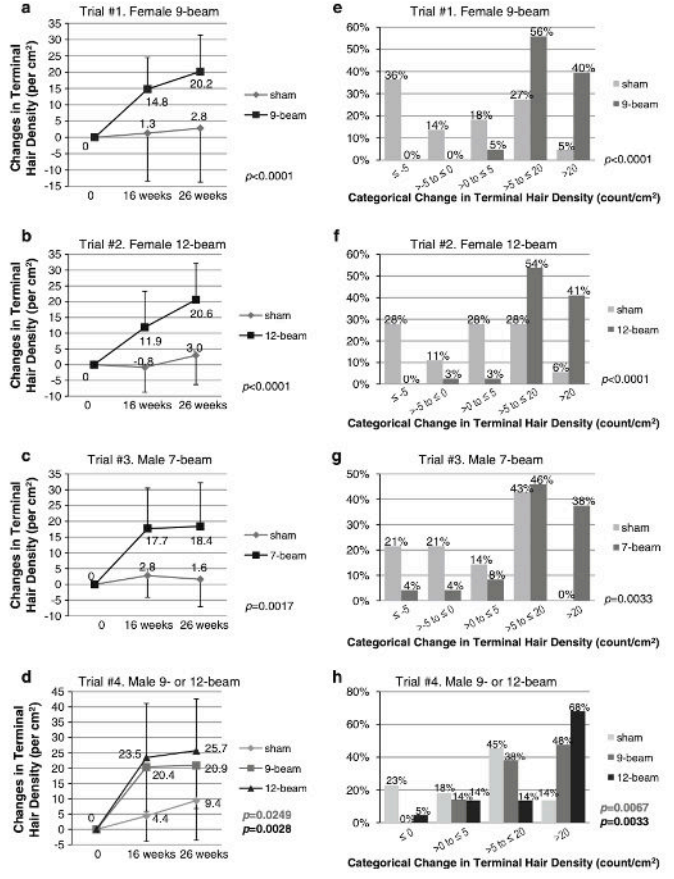
Table I. Baseline demographics of the study population (males, n = 123)

Characteristic	Value
Age (y)	
Mean ± SD	47.9 ± 8.7
Range	30–60
Race [n (%)]	
White, non-Hispanic	111 (90.2)
Hispanic	9 (7.3)
Black	0 (0)
Other	3 (2.4)
Fitzpatrick Skin Type Scale classification [n (%)]	
I	4 (3.3)
II	17 (13.8)
III	65 (52.9)
IV	37 (30.1)

Table III. Categorical changes from baseline to 26 weeks in terminal hair density[a]

Change in hair density/cm²	HairMax LaserComb® (n = 72) [n (%)]	Sham device (n = 40) [n (%)]
≤–20	1 (1.4)	7 (17.5)
≥–20 to –5	1 (1.4)	19 (47.5)
≥–5 to 0	3 (4.2)	9 (22.5)
>0 to 5	5 (6.9)	3 (7.5)
>5 to 20	34 (47.2)	2 (5.0)
>20	28 (38.9)	0 (0)

a Last value carried forward for subjects who terminated prematurely.



ORIGINAL RESEARCH ARTICLE

HairMax LaserComb® Laser Phototherapy Device in the Treatment of Male Androgenetic Alopecia

A Randomized, Double-Blind, Sham Device-Controlled, Multicentre Trial

Matt Leavitt,[1] *Glenn Charles*,[2] *Eugene Heyman*[3] and *David Michaels*[4]

Am J Clin Dermatol (2014) 15:115–127
DOI 10.1007/s40257-013-0060-6

ORIGINAL RESEARCH ARTICLE

Efficacy and Safety of a Low-level Laser Device in the Treatment of Male and Female Pattern Hair Loss: A Multicenter, Randomized, Sham Device-controlled, Double-blind Study

Joaquin J. Jimenez · Tongyu C. Wikramanayake · Wilma Bergfeld · Maria Hordinsky · Janet G. Hickman · Michael R. Hamblin · Lawrence A. Schachner

AA

- N =16 pts
- Recalcitrant AA of scalp, eyebrow, mustache
- Low-level invisible pulsed infrared diode laser (**904 nm**) wavelength, with a peak power of 150 W.

Table I. Details of alopecia areata patches and their response to treatment.

Location	No. of patients	No. of patches	Size			Gender		Results of treatment
			<2 cm²	<4 cm²	>7 cm²	Male	Female	
Scalp	6	14	–	4	10	3	3	13 complete 1 partial (10 after 1 week)
Eyebrow	3	6	1	5	–	1	2	5 complete 1 failure (4 after 1 week)
Beard	5	12	1	5	6	5	–	11 complete 1 failure (8 after 1 week)
Moustache	2	2	1	1	–	2	–	2 partial (2 after 1 week)

Journal of Cosmetic and Laser Therapy. 2006; 8: 27–30

Taylor & Francis
Taylor & Francis Group

ORIGINAL ARTICLE

Use of the pulsed infrared diode laser (904 nm) in the treatment of alopecia areata

LLLT (red and near-IR 600-1070nm)

- N = 4 pts
- Prior treatments with ILK
- LLLT yarn (Lumiton) 200-700nm

AA							
						SALT	SALT
2	M	33	Black	None	1x weekly	4%	2%
3	F	22	White	Triamcinolone injections	1x weekly	20%	19%
4	F	69	White	Triamcinolone injections	Daily	5%	2%

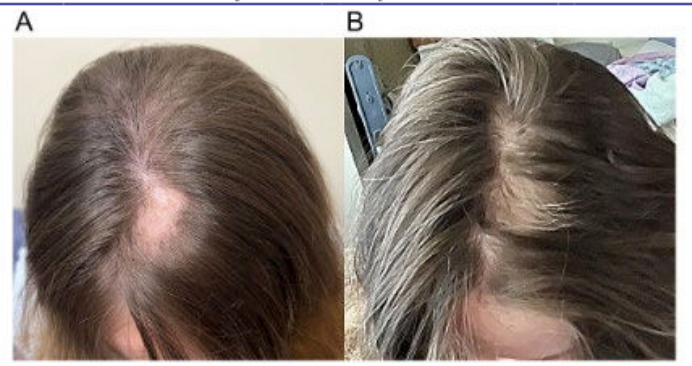


Figure 3. (A,B) Before (week 0) and after (week 12) photographs of alopecia areata of the vertex scalp.

JOURNAL OF DERMATOLOGICAL TREATMENT
2023, VOL. 34, NO. 1, 2251619
https://doi.org/10.1080/09546634.2023.2251619

Taylor & Francis
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ARTICLE

OPEN ACCESS Check for updates

Could red and near-infrared emitting fabric technology improve the severity of psoriasis, polymorphous light eruption, and alopecia areata?

Jessica N. Pixley[a], Rithi J. Chandy[a], Irma Richardson[a], Joseph L. Jorizzo[a] and Steven R. Feldman[a,b,c]

LPP

LLLT (red and near-IR 600-1070nm)

Table 2 Summary of literature on the use of low-level light therapy for treatment of lichenoid dermatosis

Authors (year)	Disease process	Type of study	Methods	LLLT specifications	Results
Fonda-Pascual et al. [6]	LPP	Prospective study of LLLT for treatment of LPP	8 subjects (5 female, 3 male) received LLLT 15 min daily for 6 months	246 red LED λ = 630 nm Exposure = 15 min	All patients had reduction of symptoms, erythema, and perifollicular hyperkeratosis. And an increase in terminal hair thickness
Gerkowicz et al. [7]	FFA and LPP	Prospective study of sLED as adjuvant therapy	16 female subjects (8 FFA, 8 LPP) received sLED 1× a week for 10 weeks	Lamp with 78 pulsed diodes λ = 630 ± 5 nm (red light) Power density = 100–120 mW/cm^2 Exposure time = 13 min 47 s	FFA and LPP severity improved. sLEDs can be used as adjuvant therapy in these patients

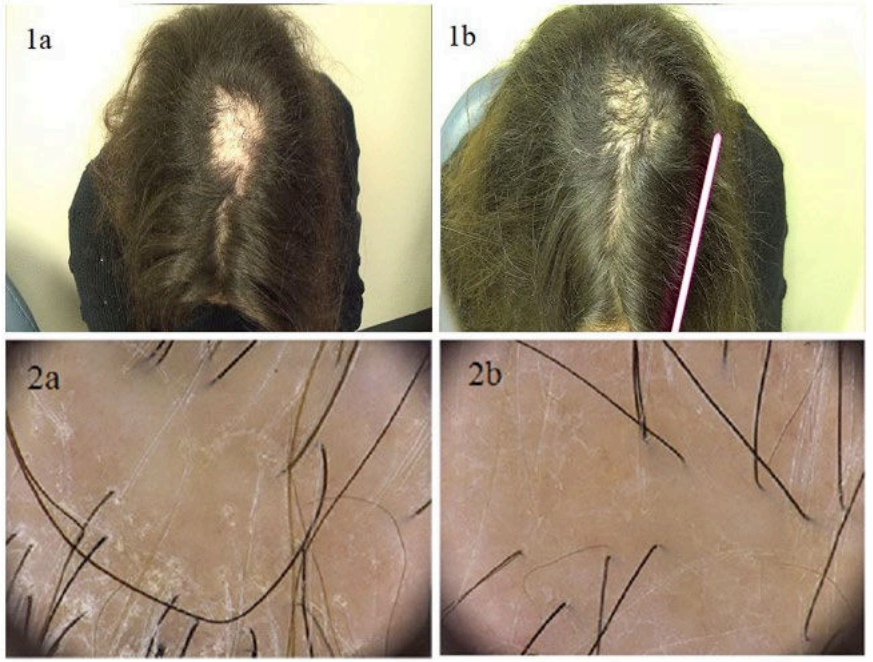


Fig. 1 A 42-year-old patient **1a** before and **1b** after 18 months of treatment with LLLT with evident hair regrowth. Scalp under ×50 magnification trichoscopy **2a** before and **2b** after 4 months of treatment with LLLT, showing reduction of peripilar casts


RESEARCH LETTER · Volume 78, Issue 5, P1020-1023, May 2018 Download Full Issue

Effectiveness of low-level laser therapy in lichen planopilaris

Pablo Fonda-Pascual, MD · Oscar M. Moreno-Arrones, MD · David Saceda-Corralo, MD · ... · Cristina Pindado-Ortega, MD · Pablo Boixeda, MD, PhD · Sergio Vaño-Galvan, MD, PhD... Show more

Affiliations & Notes Article Info

Application of superluminescent diodes (sLED) in the treatment of scarring alopecia – A pilot study

LPP

LLLT (red and near-IR 600-1070nm)

- N = 16 Females
- FFA w/ **eyebrow loss** duration 3-10 years
- LED matrix illuminator Red Beam pro+, Model APRO (MEDlight GmbH, Herford, Germany).
- Tx 1x/week for 10 weeks

Figure 1. Comparison of clinical and trichoscopic images before (**A**,**D**,**G**,**J**,**M**,**P**,**S**,**W**), after (**B**,**E**,**H**,**K**,**N**,**Q**,**T**,**X**) 10 LED irradiations, and during the post-treatment follow-up visit (**C**,**F**,**I**,**L**,**O**,**R**,**U**,**Y**). The red circle indicates localization of compared trichoscopic images. 1E, 1K, 1Q, 1X: increased number of thick eyebrow hairs and increased total eyebrow hair count after 10 LED irradiations; 1F, 1L, 1R, 1Y: reduced number of thick hairs compared with the post-treatment images, and similar or increased total eyebrow hair count compared with the trichoscopic images at baseline.

Open Access Article

Novel Application of Light-Emitting Diode Therapy in the Treatment of Eyebrow Loss in Frontal Fibrosing Alopecia

by Agnieszka Gerkowicz [1,*], Joanna Bartosińska [2], Dorota Raczkiewicz [3], Mirosław Kwaśny [4] and Dorota Krasowska [1]

Excimer Laser (308nm)

AA LPP

Excimer Laser 308 nm

- Hypothesized MOA:
  - T-cell modulation
- Adverse Effects:
  - Rare mild dry skin, irritation, scalp tenderness, paresthesia, urticaria
- AA:
  - Controlled trials
- LPP:
  - Case reports & Series

AA

Excimer Laser 308 nm

- 2020 meta-analysis
- Controlled trials (with controlled group) and all prospective studies

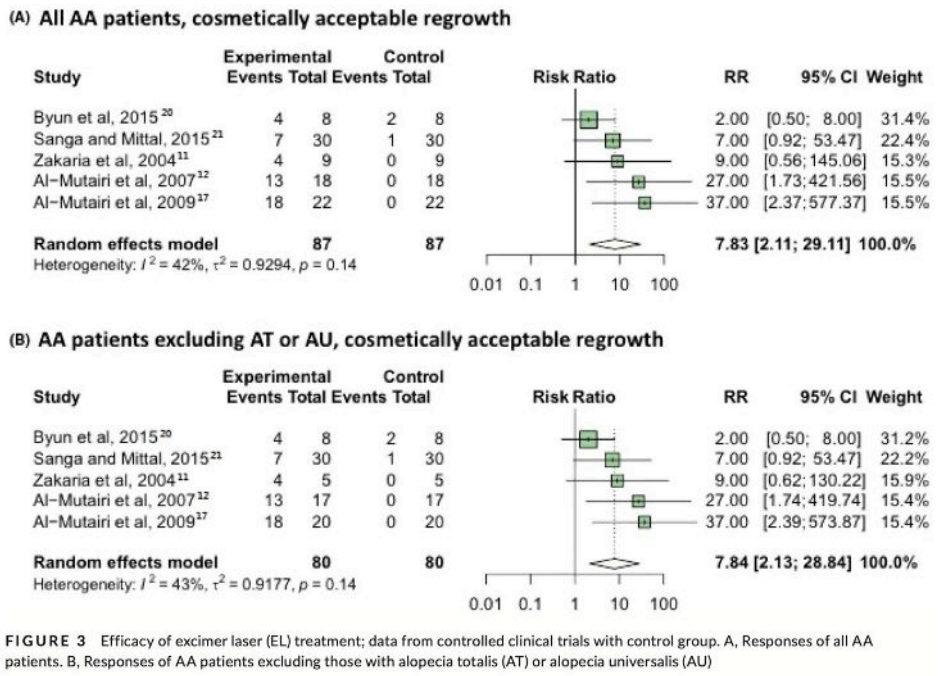
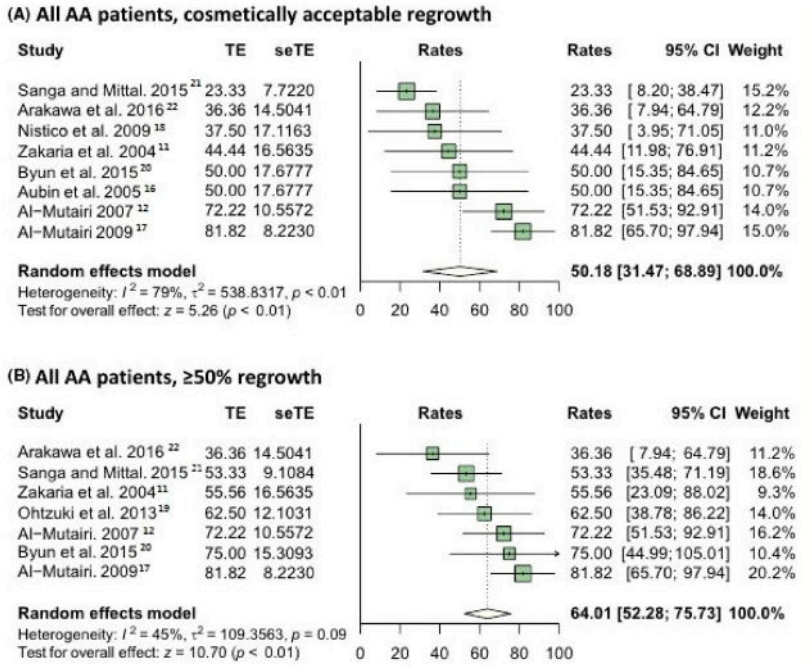


FIGURE 3 Efficacy of excimer laser (EL) treatment; data from controlled clinical trials with control group. A, Responses of all AA patients. B, Responses of AA patients excluding those with alopecia totalis (AT) or alopecia universalis (AU)



Received: 26 February 2020 | Revised: 6 July 2020 | Accepted: 16 July 2020
DOI: 10.1111/phpp.12596

ORIGINAL ARTICLE

Photodermatology, Photoimmunology & Photomedicine WILEY

Excimer laser/light treatment of alopecia areata: A systematic review and meta-analyses

AA

Excimer Laser 308 nm

- Weekly excimer vs monthly IL corticosteroid injections
- Hair regrowth initially slower with excimer treatment but one month follow-up showed equal hair regrowth

Lasers in Surgery and Medicine
ENERGY-BASED THERAPEUTICS AND DIAGNOSTICS
ASLMS AMERICAN SOCIETY FOR LASER MEDICINE & SURGERY, Inc.

CLINICAL REPORT

Comparison of the efficacy and safety of 308-nm excimer laser with intralesional corticosteroids for the treatment of alopecia areata: A randomized controlled study

Nika Kianfar MD, Shayan Dasdar MD, Hamidreza Mahmoudi MD ✉, Robabe Abedini MD, Shabnam Fahim MD, Seyed Amirhossein Hosseini MD, Maryam Daneshpazhooh MD

First published: 02 December 2021 | https://doi.org/10.1002/lsm.23501 | Citations: 3

LPP

Excimer Laser 308 nm

- N = 13, split-scalp
- Adult patients with biopsy-proven, active LPP unresponsive to conventional therapies like topical corticosteroids
- XTRAC UV-B light with 30-nanosecond pulses at a repetition rate of 250 Hz produced by xenon chloride at a wavelength of 308 nm
- Significantly reduced inflammatory activity in expressed by decreased erythema, pain, pruritus, and hyperkeratosis.
- Compared with topical therapies that require daily application, a twice-weekly laser regimen showed a greater rate of treatment compliance.

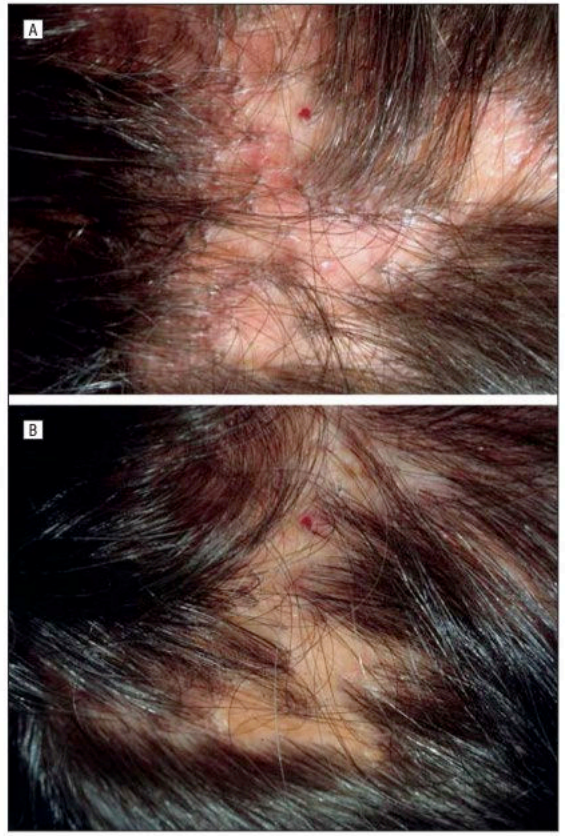


Figure. A 63-year-old woman with lichen planopilaris before (A) and after (B) treatments with monochromatic excimer laser.

Research Letter

Nov 2011

Low-Dose Excimer 308-nm Laser for Treatment of Lichen Planopilaris

Alexander A. Navarini, MD, PhD; Antonios G. A. Kolios, MD; Bettina M. Prinz-Vavricka, MD; et al

» Author Affiliations | Article Information

Arch Dermatol. 2011;147(11):1325-1326. doi:10.1001/archdermatol.2011.335

Fractional Laser

AGA

Fractional Laser

- MoA: activates Lgr5+ HFSCs and upregulating the Wnt/β-catenin pathway

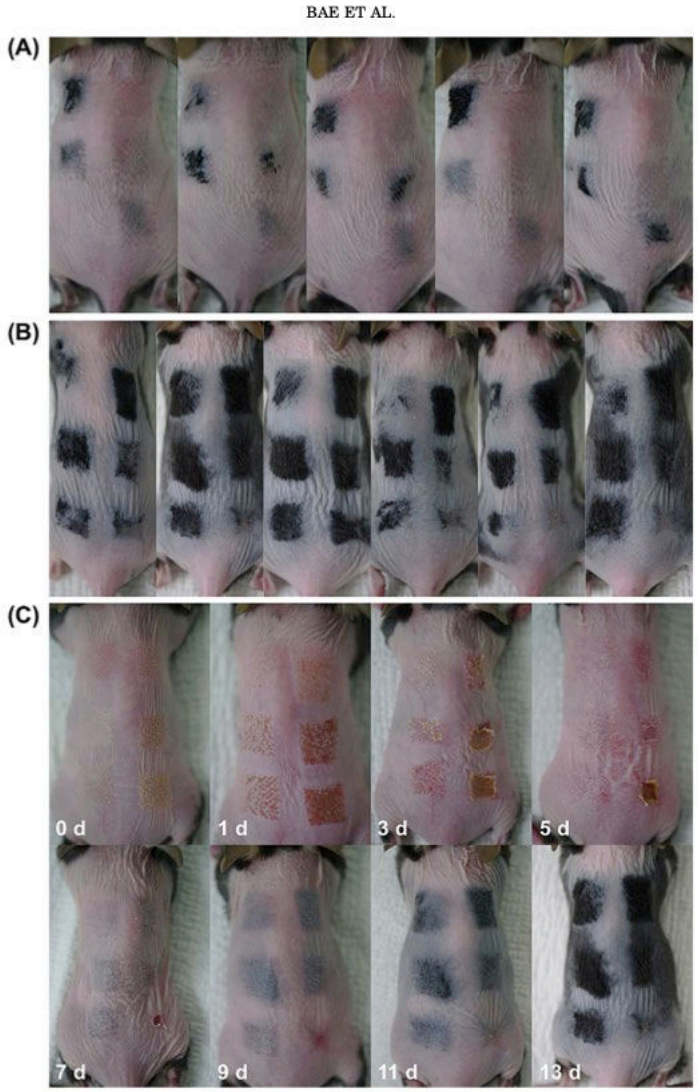


Fig. 2. Hair regrowth after ablative CO_2 fractional laser treatment. (A) Group A showed that the laser treatment with the 200 spot/cm^2 was more effective than that with 100 spot/cm^2. (B) & (C) In group B, the most effective dosage was 10 mJ/spot at 300 spot/cm^2. In the 300 spots/cm^2, energy > 10 mJ/spot was associated with lower hair regrowth potential and scar tissue formation.

› Aesthetic Plast Surg. 2024 May;48(9):1831-1845. doi: 10.1007/s00266-023-03796-z. Epub 2023 Dec 28.

Carbon Dioxide Fractional Laser Treatment Induces Lgr5+ Stem Cell Activation and Hair Regrowth Through the Canonical Wnt/β-Catenin Pathway

› Lasers Surg Med. 2015 Jul;47(5):433-40. doi: 10.1002/lsm.22358. Epub 2015 May 6.

Hair regrowth through wound healing process after ablative fractional laser treatment in a murine model

Jung Min Bae [1], Han Mi Jung [1], Boncheol Goo [2], Young Min Park [3]

AGA

Fractional Laser

- MoA: activates Lgr5+ HFSCs and upregulating the Wnt/β-catenin pathway
- One study showed superiority of topical minoxidil 5% solution QD

	Laser group		Minoxidil group		Δ (baseline to the Week 10)		*p* value
	Baseline	Week 10	Baseline	Week 10	Laser	Minoxidil	
Hair count	164.93 ± 40.51	196.27 ± 40.85 [a]	161.07 ± 38.71	177.20 ± 40.41 [a]	31.33 ± 13.56	16.13 ± 7.36	0.001
Hair density (hair/cm^2)	118.67 ± 28.47	140.92 ± 29.34 [a]	115.63 ± 27.78	127.20 ± 29.02 [a]	22.25 ± 9.59	11.57 ± 5.25	0.001
Average diameter of terminal hair(μm)	61.55 ± 19.06	63.93 ± 22.38 [a]	51.16 ± 14.53	69.79 ± 11.4 [b]	2.38 ± 15.06	1.15 ± 3.35	0.761

› Aesthetic Plast Surg. 2024 May;48(9):1831-1845. doi: 10.1007/s00266-023-03796-z. Epub 2023 Dec 28.

Carbon Dioxide Fractional Laser Treatment Induces Lgr5+ Stem Cell Activation and Hair Regrowth Through the Canonical Wnt/β-Catenin Pathway

Randomized Controlled Trial › J Cosmet Dermatol. 2024 May;23(5):1638-1644. doi: 10.1111/jocd.16173. Epub 2024 Jan 21.

Investigator-blinded, controlled, and randomized comparative study on 1565 nm non-ablative fractional laser versus 5% minoxidil for treatment of androgenetic alopecia

AGA

Fractional Laser

Table 1 Fractional lasers in the treatment of alopecia

Laser	Wavelength (nm)	Author	Subject group	Alopecia type	Energy settings	Spot size (mm)	No. of passes	No. of sessions	Intervals (week)	Adverse effects
Erbium-glass	1550	Lee et al. [4]	28 female patients	Alopecia areata	6 mJ/spot, 800 spot/cm^2	5–10	1	10	2	Pruritus
		Kim et al. [5]	20 male patients	Androgenic alopecia	5 mJ/spot, 300 spots/cm^2	NR	NR	5	2	Breakage of hair shaft, pain, mild erythema, puritus, dandruff, dryness
		Cho et al. [6]	17 patients (9 male, 8 female)	Various hair disorders/alopecias	6–8 mJ/spot, 300 spots/cm^2/pass	NR	2	8–22	NR	Transient post-treatment crusting, scaling, erythema, and edema
		Eckert et al. [7]	5 (2 male, 3 female)	Alopecia areata	6–8 mJ/spot, 30–45 mJ/cm^2	NR	8–10	2–3	3 to 6	Pain
		Yoo et al. [8]	1 male patient	Alopecia areata	10–15 mJ/spot, 300 spot/cm^2/pass	NR	2	24	1	None reported
		Tsai [9]	1 male patient	Alopecia areata	NR	NR	NR	2	1	NR
Erbium: YAG	2940	Ke et al. [10]	C57BL/6 mice	Androgenic alopecia	1200 mJ/cm^2	15–40	2	3	1	Causitry, hypopigmentation
CO_2	10,600	Bae et al. [11]	C57BL/6 mice	Androgenic alopecia	10 mJ/spot, 300 spots/cm^2	10	1	1	0	Scar tissue reformation
	NR	Yalici-Armagan and Elcin [12]	32 patients (19 male, 13 female)	Alopecia areata	10–45 mJ/cm^2, 75–100 spot/cm^2/pass	NR	NR	3–6	2 or 4	Pain
	10,600	Cho et al. [6]	17 patients (9 male, 8 female)	Various hair disorders/alopecias	30–50 mJ/spot, 150 spots/cm^2	120 μm	NR	8–22	NR	Transient post-treatment crusting, scaling, erythema, and edema
	10,600	Issa et al. [13]	3 female patients	Alopecia areata	60 W, 60 mJ/pixel	125–150 μm	2	1–6	3	Mild burning

Lasers Med Sci
DOI 10.1007/s10103-017-2306-7

REVIEW ARTICLE

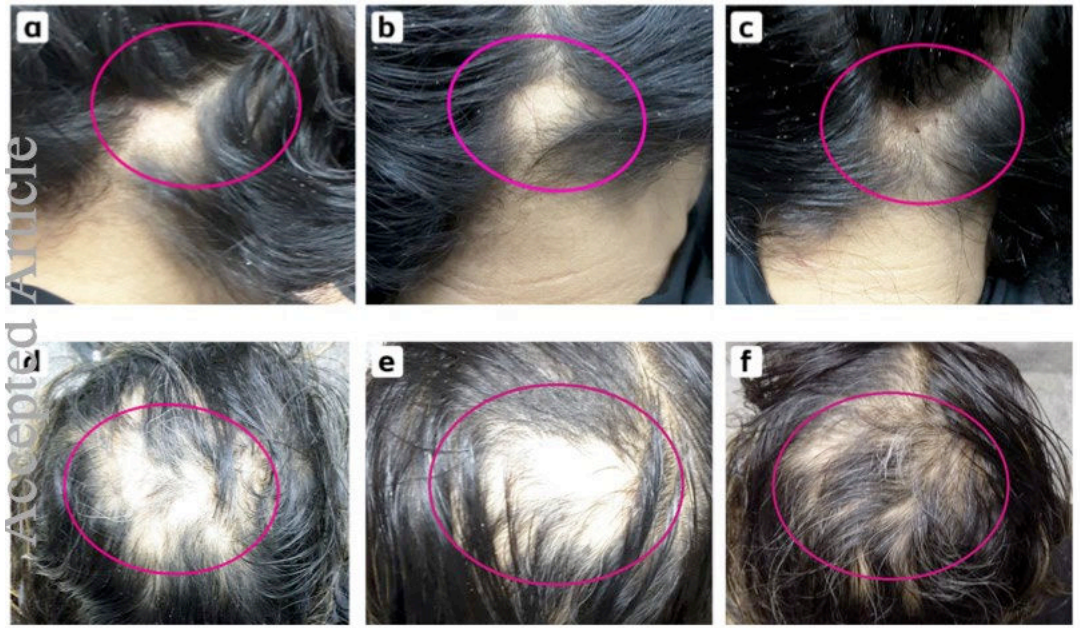
Efficacy of fractional lasers in treating alopecia: a literature review

Marina Perper[1] · Adam S. Aldahan[1] · Rachel A. Fayne[1] · Christopher P. Emerson[1] · Keyvan Nouri[1]

AA

Fractional Laser

- MoA: induction of T cell apoptosis, arresting hair follicles in telogen stage and promoting anagen stage and denovo neogenesis of hair follicles from non-hair follicle stem cells
- One patch was treated by FCO2 laser every 2 weeks for 3 to 6 sessions, while the other treated with intradermal injection of Triamcinolone Acetonide monthly for three sessions maximally.
- There was a highly significant improvement with FCO2 laser rather than ILCs 3 months after last session



Follow up after 3 months	FCO2 laser		ILCs		Wilcoxon Signed Ranks Test	
	Median	IQR	Median	IQR	p value	sig.
MISP	4 (>75%-99%)	2.5 -4.5	1 (<25%)	1 - 2	<0.001	HS
	Number	%	Number	%		
Minimal improvement	2	10%	11	55%	<0.001	HS
Moderate improvement	3	15%	9	45%		
Marked improvement	3	15%	0	0%		
Excellent improvement	7	35%	0	0%		

DERMATOLOGIC THERAPY

Short Paper

Comparative study between fractional carbon dioxide laser vs intralesional steroid injection in treatment of alopecia areata

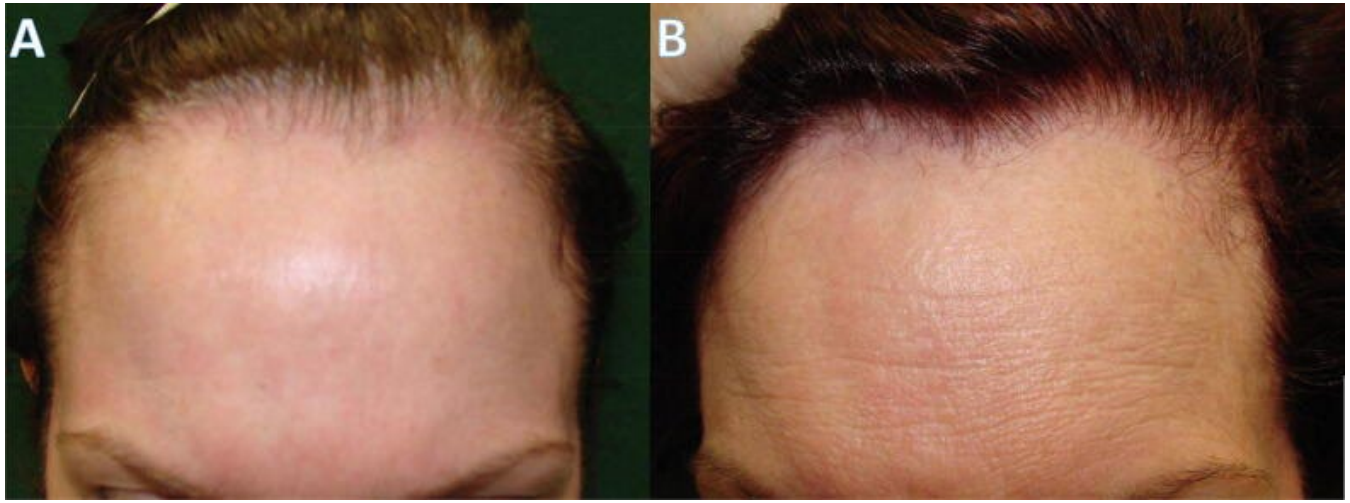
Rania El-Husseiny, Sara Elframawy, Mohammed Abdallah

First published: 01 June 2020 | https://doi.org/10.1111/dth.13742 | Citations: 17

LPP

Fractional Laser

- MoA: non-ablative fractional laser to target dermis instead of epidermis



Case Reports > Int J Womens Dermatol. 2020 Nov 4;7(3):355-356.
doi: 10.1016/j.ijwd.2020.10.007. eCollection 2021 Jun.

Frontal fibrosing alopecia treatment with Nd:YAG (1064 nm) nonablative laser

Jacob Subash [1], Ariana Eginli [1], Leonora Bomar [1], Amy McMichael [1]

Platelet-Rich Plasma (PRP)

AGA | AA | LPP

PRP

- Hypothesized MOA:
  - Pro-stimulatory growth factors (i.e. bFGF, PDGF, VEGF, EGF, TGF-beta, IGF-1)
  - Activated vs non-activated PRP
- Adverse Effects:
  - Rare mild irritation, scalp tenderness, paresthesia, urticaria
  - Rare koebnerization of LPP (Dr. Issa's experience)

https://www.youtube.com/shorts/AGwa8nfRmF4

AA

PRP

- PRP may be anti-inflammatory through TGF-beta (immunomodulatory) and suppression of MCP-1 (chemokine for lymphocytes)
- No standardized protocol
- RCTs:
  - Taieb et al (2017) – PRP (3 sessions q4 wks) superior to placebo and minoxidil 5%

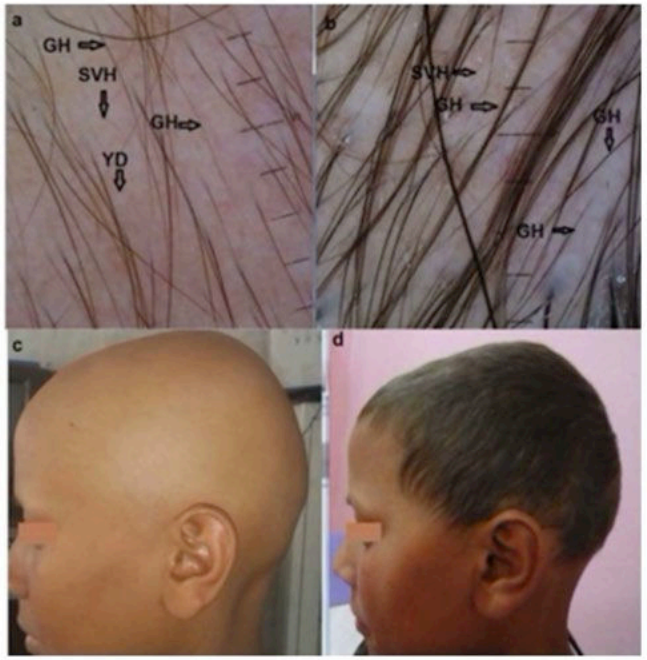


FIGURE 2 a–d: A 15-years-old male patient presented by alopecia universalis of 2-years. (a) Trichoscopy after 1 month of PRP treatment shows short vellus hairs (SVH), upright growing hair (GH) and yellow dots (YD). (b) Trichoscopy after 3 months shows upright growing hair (GH) and short vellus hairs (SVH). (c) Digital photo before PRP treatment. (d) A photo after 3 months of PRP treatment shows scalp, eye brows, and eye lashes were completely resolved

Received: 10 June 2016 | Revised: 13 September 2016 | Accepted: 30 September 2016
DOI 10.1111/dth.12437

ORIGINAL PAPERS

WILEY DERMATOLOGIC THERAPY

Platelets rich plasma versus minoxidil 5% in treatment of alopecia areata: A trichoscopic evaluation

REVIEW · Volume 20, Issue 1, PS45-S49, November 2020 · Open Archive Download Full Issue

Platelet-Rich Plasma in the Treatment of Alopecia Areata: A Review

Hind M. Almohanna [1] · Azhar A. Ahmed [2] · Jacob W. Griggs [3] · Antonella Tosti [3]

LPP

PRP

- 2024 PRISMA study on PRP for scarring alopecia
- 11 studies found (case reports); LPP – 7 studies
- Some cases showed improvement in perifollicular inflammation and hair shedding
- Some experienced increased shedding and inflammation*
  - Personally experienced by Dr. Issa

December 2024 1076 Volume 23 • Issue 12
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Evaluating Anti-Inflammatory Potential of Platelet-Rich Plasma in Scarring Alopecia: A Systematic Review

Susie Suh MD PhD,[a,b*] Minjun Park BA,[a,c*]
Arash Babadjouni MS,[a] Natasha Atanaskova Mesinkovska MD PhD[a]

RESEARCH LETTER · Volume 83, Issue 5, P1506-1509, November 2020

Use of platelet-rich plasma in lichen planopilaris and its variants: A retrospective case series demonstrating treatment tolerability without koebnerization

Katerina Svigos, BA · Lu Yin, BA · Katharina Shaw, MD · ... · Erik Peterson, MD · Kristen Lo Sicco, MD · Jerry Shapiro, MD

LPP

PRP

- 2024 PRISMA study on PRP for scarring alopecia
- 11 studies found (case reports); LPP – 7 studies
- Some cases showed improvement in perifollicular inflammation and hair shedding
- Some experienced increased shedding and inflammation*
  - Personally experienced by Dr. Issa

PRP should NOT be considered as 1st-line tx at this time

December 2024 1076 Volume 23 • Issue 12
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Evaluating Anti-Inflammatory Potential of Platelet-Rich Plasma in Scarring Alopecia: A Systematic Review

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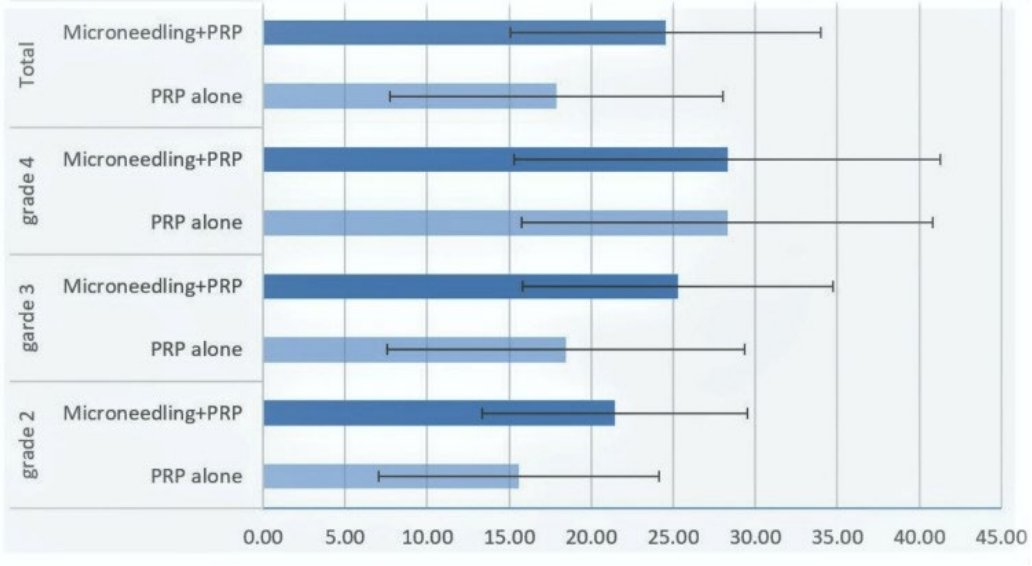
Microneedling

AGA

Microneedling

- Hypothesized MOA:
  - Microtrauma to stimulate wound healing
  - Triggers increased blood flow (help overcome microvascular insufficiency) and growth factors (similar to PRP)
  - One study showed combination with PRP is synergistic but less pronounced difference with greater Norwood grade*
  - Another split-scalp study showed no statistical difference



Average Hair Density (per sq-cm)	Side				Paired *t*-test
	MN		MN+PRP		
	Mean	SD	Mean	SD	*p*
Pre-Therapy	94.524	23.579	95.143	22.060	0.804
Post-Therapy	105.333	23.795	109.809	20.653	0.177

> Cureus. 2022 Oct 18;14(10):e30418. doi: 10.7759/cureus.30418. eCollection 2022 Oct.

Comparison of Efficacy of Platelet-Rich Plasma (PRP) With PRP Microneedling in Androgenetic Alopecia

> Int J Trichology. 2020 Jul-Aug;12(4):156-163. doi: 10.4103/ijt.ijt_64_20. Epub 2020 Sep 19.

Dermoscopic Assessment of Microneedling Alone versus Microneedling with Platelet-Rich Plasma in Cases of Male Pattern Alopecia: A Split-Head Comparative Study

Botulinum Toxin

AGA

Botulinum Toxin A

- Hypothesized MOA
  - Relaxation of scalp muscles → reduced tension → increased circulation & oxygenation → increased DHT outflow
  - Direct effect on TGF-beta-induced perifollicular fibrosis?
  - Direct effect on inhibitor of DPC apoptosis?
- Adverse Events:
  - Pain, headache, dizziness, itchiness

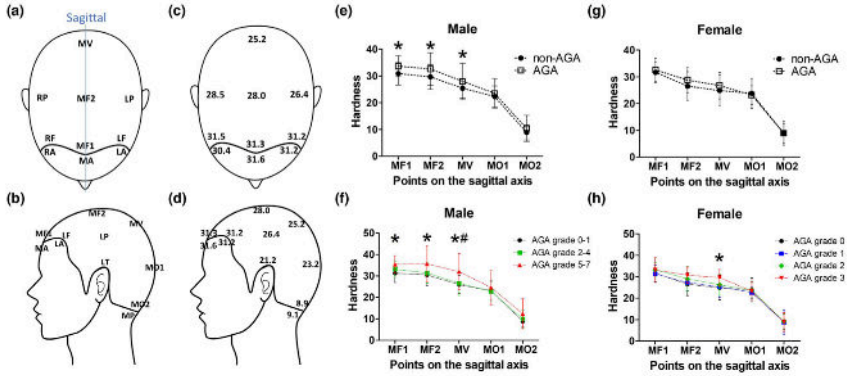
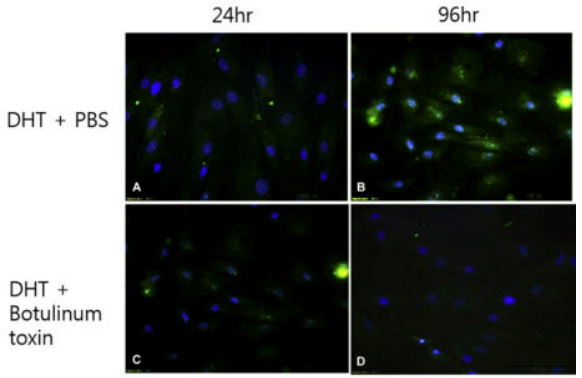


Table 1 The association of scalp hardness with the occurrence and severity of AGA by GEE test†

Sex	Outcome	Independent variable	OR	95% CI	*P*-value
Male	AGA vs. non-AGA	Hardness	1.11	1.04–1.19	**0.003**
	AGA grade (0–1, 2–4 and 5–7)		1.11	1.03–1.19	**0.004**
Female	AGA vs. non-AGA	Hardness	1.04	0.96–1.13	0.32
	AGA grade (0, 1, 2 and 3)		1.07	0.997–1.14	0.061



Suppression of DHT-induced expression of TGF-B1 in DPCs

Home › Aesthetic Plastic Surgery › Article

Botulinum Toxin Type A Alleviates Androgenetic Alopecia by Inhibiting Apoptosis of Dermal Papilla Cells via Targeting circ_0135062/miR-506-3p/Bax Axis

Original Articles | Basic Science | Published: 29 January 2024
Volume 48, pages 1473–1486, (2024) Cite this article

RESEARCH LETTER · Volume 83, Issue 6, P1838-1839, December 2020

The effect of intradermal botulinum toxin on androgenetic alopecia and its possible mechanism

Uri Shon, MD [a] · Myung Hwa Kim, MD [a] · Dong Yoon Lee, MD [a] · Se Hwan Kim, PhD [b] · Byung Cheol Park, MD [a]

JEADV

Letter to the Editor

Androgenetic alopecia is associated with increased scalp hardness

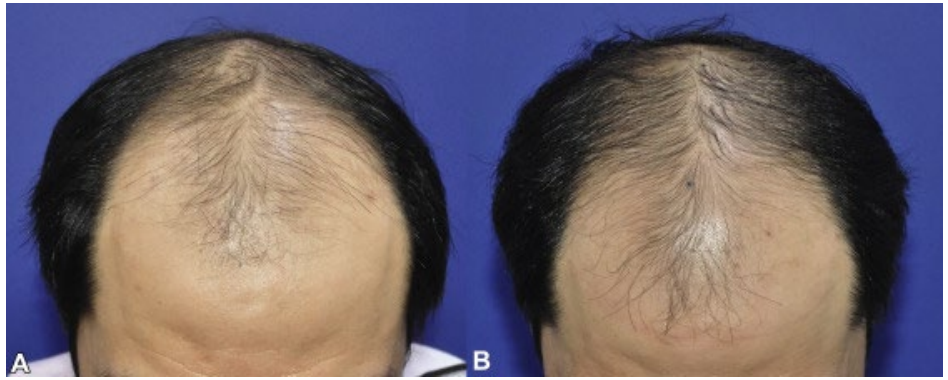
K.-Y. Chen, S.-H. Lin, S.-Y. Cheng, T.-K. Lo, H.-Y. Huang, M.-J. Tang, C.-C. Yang

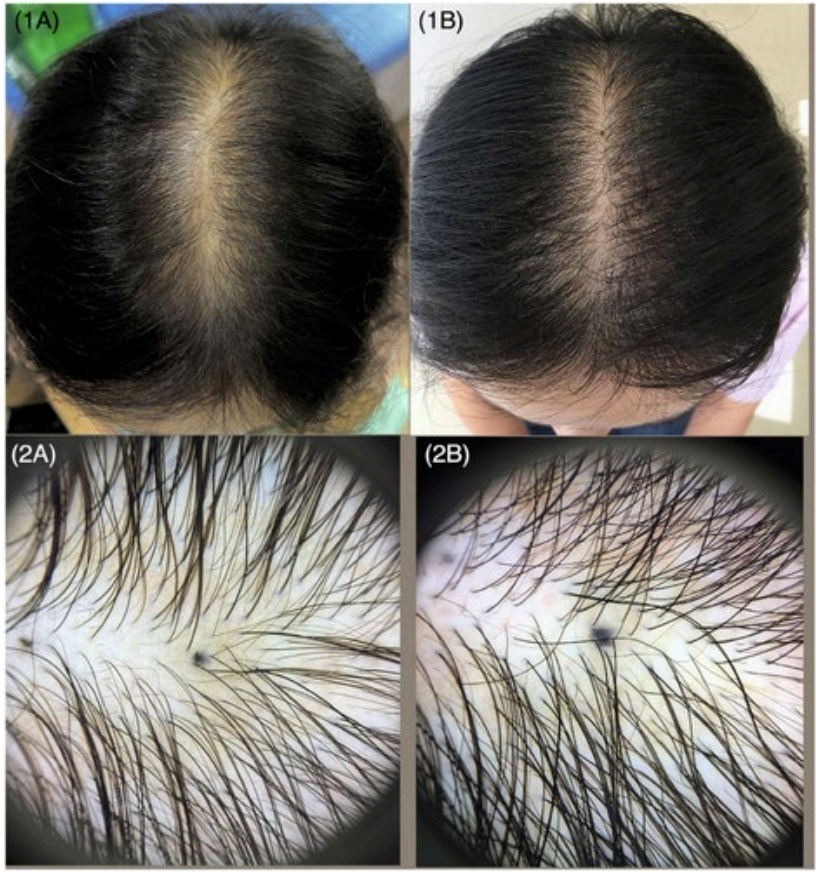
First published: 15 January 2020 | https://doi.org/10.1111/jdv.16194 | Citations: 6

AGA

Botulinum Toxin A

- General injection technique:
  - Dilute BTX-A 100 U in 2 mL of 0.9% saline (5U/0.1 mL)
  - Clean scalp with with 70% ethyl alcohol
  - 20 injection sites spaced 2-3cm apart
  - 5U per injection site
  - Intradermal vs intramuscular?
  - Every 3 months, 3-4 times?





RESEARCH LETTER

The effect of intradermal botulinum toxin on androgenetic alopecia and its possible mechanism

Uri Shon, MD · Myung Hwa Kim, MD · Dong Yoon Lee, MD · Se Hwan Kim, PhD · Bong Cheol Park, MD, PhD

Skin Research & Technology

Forward Series

ORIGINAL ARTICLE | Open Access

Efficacy and safety of botulinum toxin A in the treatment of female pattern hair loss

Lifang Hu, YeQin Dai, Hongyan Zhang, Yi Wu, Tao Wang, Xiuzu Song

Home › Archives of Dermatological Research › Article

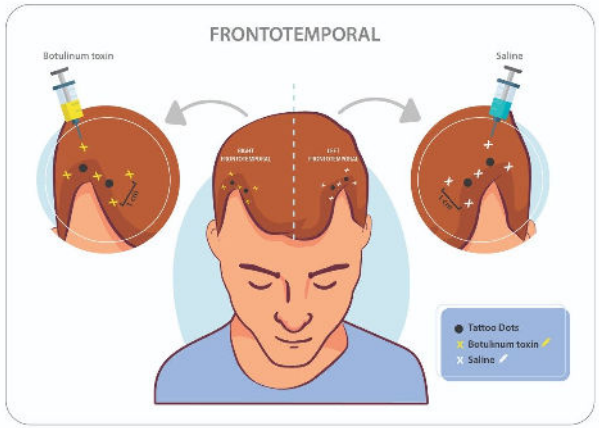
Assessing the efficacy and quality of Life improvements of botulinum toxin type a with topical minoxidil versus topical minoxidil in male androgenetic alopecia: a randomized controlled trial

Original Paper | Published: 17 August 2024

AGA

Botulinum Toxin A

- **Conflicting evidence by Melo et al. (2024) in first randomized, triple-blind, placebo-controlled trial**
- N = 13 males
- intraMUSCULAR injections in frontal area
- intraDERMAL injections in vertex (near aponeurotic galea, lack of musculature)
- Tx at weeks 0 & 12, 50 IU BTX vs saline (split-scalp)
  - 25 IU injected into two 1 cm2 scalp areas, which differs from previous studies with injections of 30-150 IU distributed across either half or the entire scalp
- Evaluation at week 24
- **BTX did NOT improve hair growth**



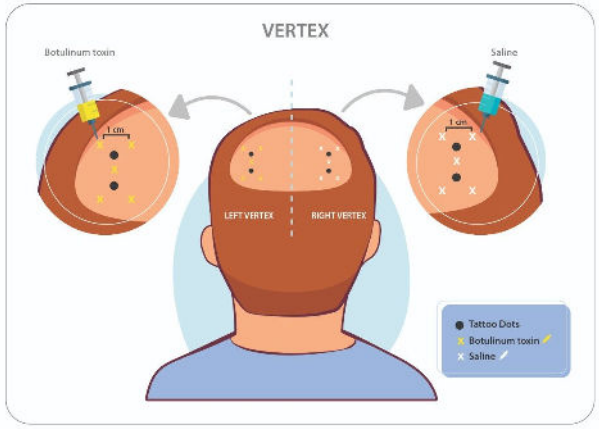


Table II. Main outcomes for participants in the study (H2H)

	Botulinum toxin (n = 13)			Placebo (n = 13)				
	T_0	T_{24}	P value*	T_0	T_{24}	P value*	Difference of change (CI 95%)	P value†
Density of hair/cm^2, mean (SD)								
Frontal								
Terminal	99.3 (45.5)	85.5 (48.5)	.904	103.7 (30.6)	92.7 (31.7)	.882		
Change (T_{24}-T_0)	-	−13.8 (36.1)		-	−11.0 (32.0)		−2.8 (−18.1; 12.5)	.652
Total	216.0 (56.4)	218.8 (56.5)	.290	216.3 (48.0)	219.2 (54.2)	.235		
Change (T_{24}-T_0)	-	2.7 (17.3)		-	3.0 (14.4)		0.3 (−11.9; 12.4)	.576
Vertex								
Terminal	118.2 (42.3)	95.9 (46.0)	.979	119.4 (47.8)	98.7 (40.8)	.980		
Change (T_{24}-T_0)	-	−22.3 (35.6)		-	−20.7 (32.3)		−1.6 (−19.5; 16.3)	.848
Total	216.9 (40.0)	217.7 (39.7)	.408	217.5 (40.7)	225.4 (49.2)	.025		
Change (T_{24}-T_0)	-	0.9 (13.4)		-	7.9 (13.1)		7.0 (−1.66; 15.7)	.948

RESEARCH LETTER · Volume 91, Issue 5, P996-998, November 2024 Download Full Issue

Efficacy of botulinum toxin in male androgenetic alopecia: A triple-blind, randomized clinical trial

Daniel Fernandes Melo, MSc, MD [a] · Paulo Müller-Ramos, PhD, MD [b] · Rita Fernanda Cortez de Almeida, MD [a] · ... · André Luiz Vairo Donda, MD [a] · Daniela Alves Pereira Antelo, PhD, MSc, MD [a] · Carlos Baptista Barcaui, PhD, MSc, MD [c] ... Show more

Autologous Celleular Micrografts

AGA

Autologous Cellular Micrografts

- Hypothesized MOA:
  - Mature hair follicle mesenchymal stem cells (HF-MSCs) located in hair bulge are multipotent cells with key role in HF regeneration and other scalp skin structures
  - Self-regenerate b/w telogen and anagen phases
  - Can migrate down hair matrix to become **progenitor cells** ultimately forming internal hair follicles and hair stem
  - Helps to overcome DHT-driven process that suppress dermal papilla cells (DPCs)
  - 2-2.5 mm punch biopsies to harvest follicles from pre-mastoid occipital hairline
  - Obtain **progenitor cell-rich micrograft (NOT stem cell)**
- Adverse Effects:
  - Low risk of redness, swelling, tenderness, infection, discomfort, scarring at the injection site

Journal of Cellular Physiology

ORIGINAL RESEARCH ARTICLE

Progenitor-cell-enriched micrografts as a novel option for the management of androgenetic alopecia

Rafael G. Ruiz, Jose M. C. Rosell, Gabriele Ceccarelli, Ciro De Sio, Gabriella C. De Angelis, Hernan Pinto, Carlo Astarita, Antonio Graziano

First published: 23 October 2019 | https://doi.org/10.1002/jcp.29335 | Citations: 19

RESEARCH ARTICLES | OCTOBER 22 2024

Role of Autologous Micrografting Technology through Rigenera® System in the Treatment of Androgenetic Alopecia

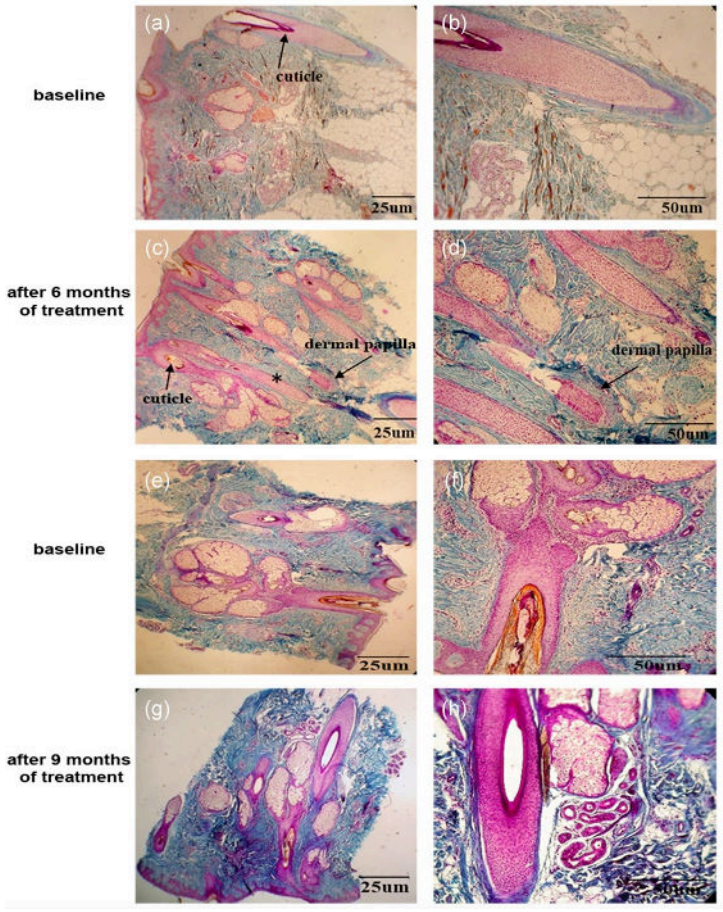
Subject Area: Dermatology

Colombina Vincenzi; Norma Cameli; Valeria Pessei; Antonella Tosti

AGA

Autologous Cellular Micrografts

- Less adipose, thickened DPC, more regular/structured collagen
- Increased cell proliferation



Journal of Cellular Physiology

ORIGINAL RESEARCH ARTICLE

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Subject Area: Dermatology

Colombina Vincenzi; Norma Cameli; Valeria Pessei; Antonella Tosti

AGA

Autologous Cellular Micrografts

- N=140 (113 females, 27 males)
- ACM monotherapy x1 session
- Improvement across all scalp regions w.r.t. hair density, shaft thickness, etc.)

Table 1 Pre- and Post-Intervention Trichometry Findings by Scalp Region (Intrasubject Analysis)

Parameter (Unit)	Scalp Region	Baseline		Outcome		R	Mean Absolute Change[a]	p-value
		Mean	SD	Mean	SD			
Positive parameters								
Hair density (N/cm^2)	Frontal	176.87	42.86	182.36	42.49	0.807	5.49	0.015*
	Temporal	134.01	30.48	138.51	29.29	0.752	4.50	0.013*
	Occipital	175.50	38.11	182.62	39.33	0.694	7.12	0.006*
Average hair shaft thickness (μm)	Frontal	48.49	8.14	50.12	9.19	0.740	1.64	0.003*
	Temporal	52.86	9.08	54.74	9.28	0.753	1.88	0.001*
	Occipital	55.58	9.08	56.54	8.93	0.703	0.96	0.102
% thick hair	Frontal	45.71	16.02	48.11	16.98	0.754	2.40	0.016*
	Temporal	54.31	16.18	57.57	15.91	0.715	3.26	0.002*
	Occipital	59.11	16.31	60.85	15.75	0.734	1.74	0.081
Cumulative hair thickness	Frontal	8.50	2.21	9.06	2.63	0.784	0.56	<0.001*
	Temporal	7.05	1.87	7.52	1.76	0.799	0.48	<0.001*
	Occipital	9.65	2.07	10.16	2.12	0.717	0.51	<0.001*
No. follicular unit (%)	Frontal	82.67	12.08	84.31	11.48	0.658	1.64	0.048*
	Temporal	65.17	11.47	66.47	10.98	0.660	1.30	0.099
	Occipital	72.29	12.65	75.06	12.35	0.386	2.77	0.019*

Clinical, Cosmetic and Investigational Dermatology
Dovepress
ORIGINAL RESEARCH

Short-Term Efficacy of Autologous Cellular Micrografts in Male and Female Androgenetic Alopecia: A Retrospective Cohort Study

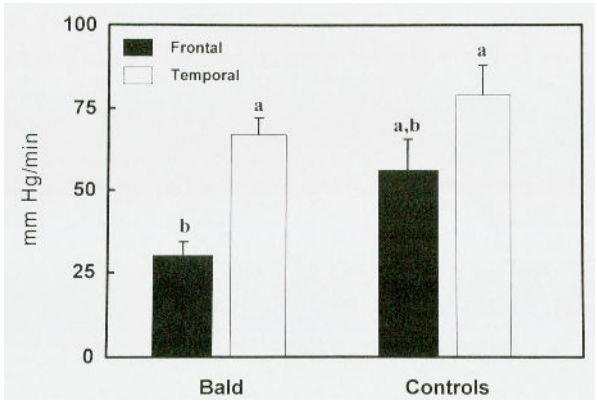
Emerging Procedural Therapies

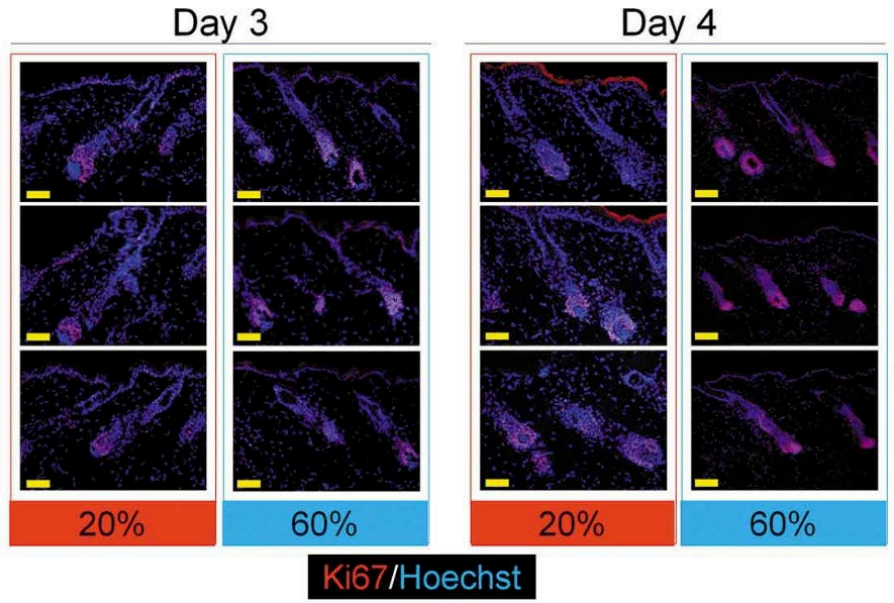
Hyperoxygenation Therapy

AGA

Hyperoxygenation Therapy

- Hypothesized MOA
  - Microvascular insufficiency to regions of the scalp that lose hair in male pattern baldness → less transcutaneous Po2
    - Example in facelift surgery w/ hair loss due to transient ischemia
  - Normobaric oxygenation (NBO) or hyperbaric oxygenation may help reverse ischemic damage
    - Hyperbaric (increased pressure) to compact size of O2 gas molecules for more efficient diffusion to target tissue
    - Increase hair fiber growth in anagen
    - Shown to delay anagen → catagen transition in C57BL/6JJcl mouse model
- Adverse Events
  - Hyperbaric oxygenation may lead to oxygen toxicity if >2 hrs





TranscutaneousP_{O2} of the Scalp in Male Pattern Baldness: A New Piece to the Puzzle

Goldman, Boris E. M.D.; Fisher, David M. M.D.; Ringler, Steven L. M.D.

Author Information

Plastic and Reconstructive Surgery 97(6):p 1109-1116, May 1996.

Research Paper

The Effects of Ischemia and Hyperoxygenation on Hair Growth and Cycle

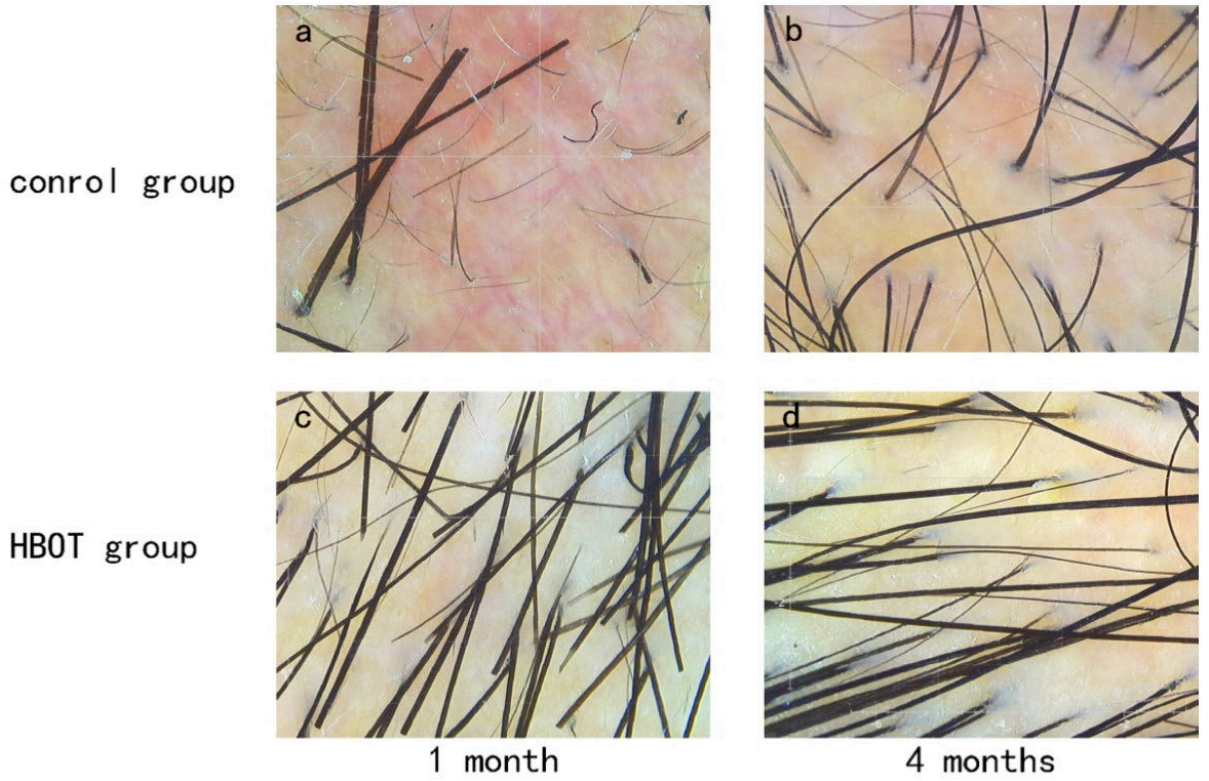
Harunosuke Kato, Kahori Kinoshita, Natsumi Saito, Koji Kanayama, Masanori Mori, Natsumi Asahi, ...show all

Pages 83-94 | Received 22 Sep 2018, Accepted 22 Jun 2020, Published online: 30 Jul 2020

AGA

Hyperoxygenation Therapy

- Randomized trial of HBOT + FUE vs FUE transplantation monotherapy
- Lower post-op shedding, folliculitis and itching in HBOT group
- HBOT as possible adjuvant for transplant



JCD Journal of Cosmetic Dermatology
Forward Series
ORIGINAL CONTRIBUTION

The effect of hyperbaric oxygen therapy combined with hair transplantation surgery for the treatment of alopecia

Zhe-Xiang Fan MD, PHD, Yuyang Gan MD, Qian Qu MD, PHD, Jin Wang MD, PHD, Yang Lunan MD, PHD, Bingcheng Liu MD, PHD, Ruosi Chen MD, PHD, Zhi-Qi Hu MD, PhD, Yong Miao MD, PhD

First published: 08 August 2020 | https://doi.org/10.1111/jocd.13665 | Citations: 9

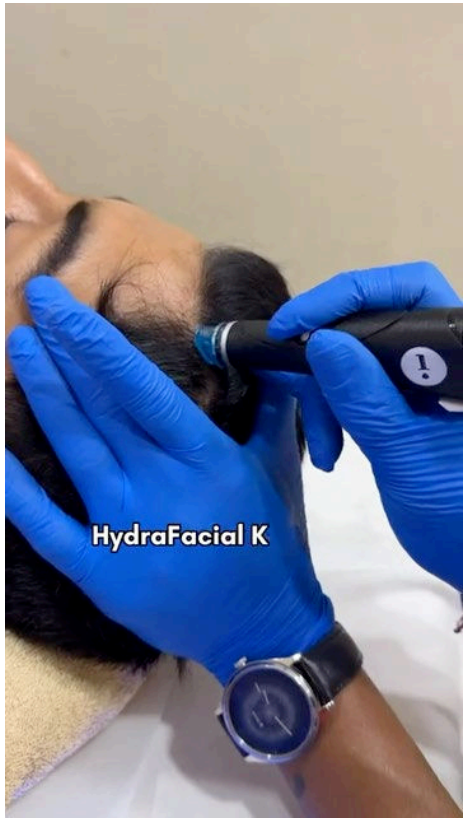
Hydradermabrasion

AGA

Hydradermabrasion

- Hypothesized MOA
  - Increased vascular microcirculation
  - Reduce inflammation (i.e. seborrhea)

- Clinical trials currently underway



Recruiting

Hydraderm for Androgenic Alopecia

ClinicalTrials.gov ID NCT05426629

Sponsor University of Minnesota

Information provided by University of Minnesota (Responsible Party)

Last Update Posted 2024-04-16

Completed

Keravive by Hydrafacial for Scalp Health and Enhanced Hair Quality

ClinicalTrials.gov ID NCT06112782

Sponsor Beauty Health

Information provided by Beauty Health (Responsible Party)

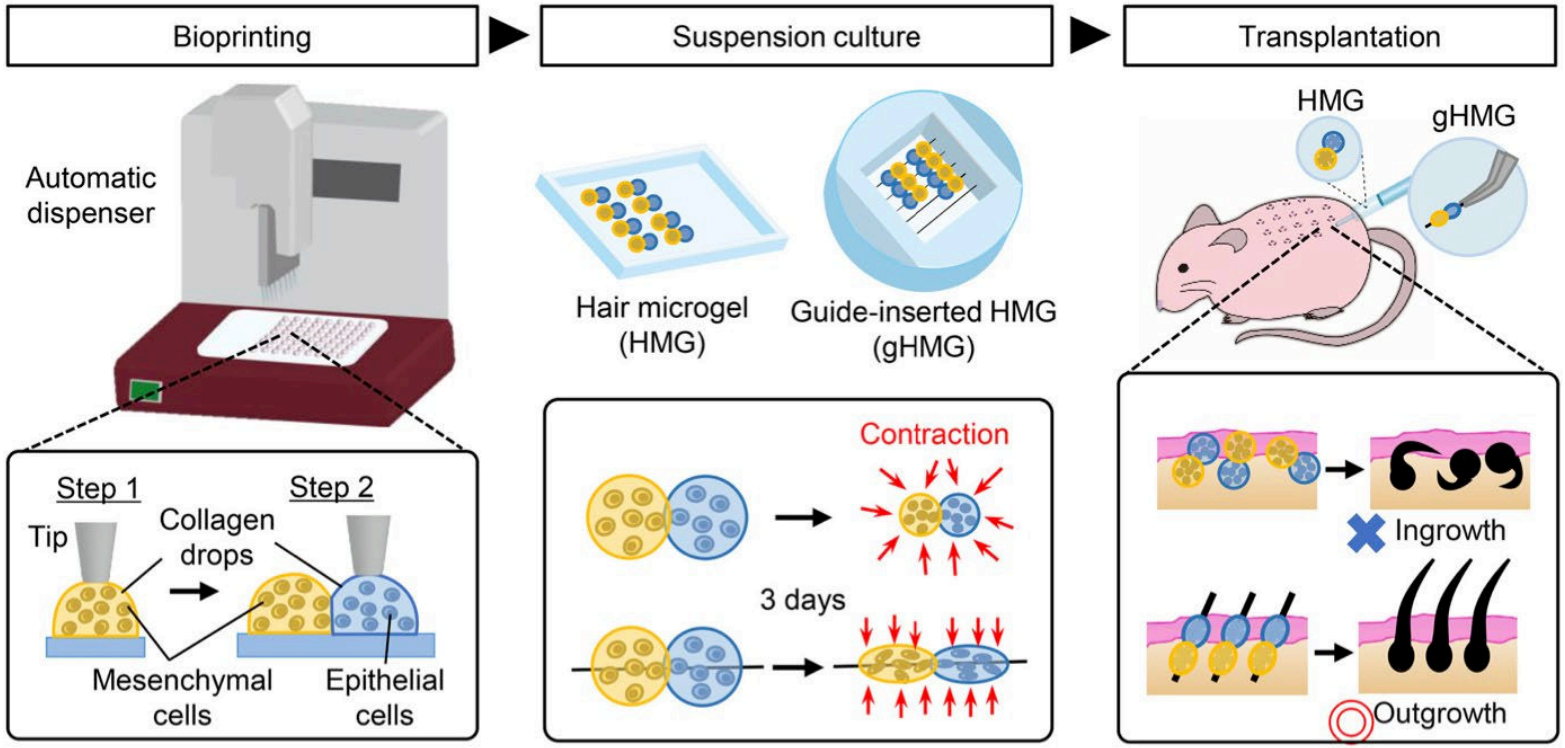
Last Update Posted 2023-11-01

Bio-Printing

AGA

Bioprinting

- Large-scale printing of epithelial and mesenchymal cells appropriately oriented with a guide in microgel that can be transplanted
- Bioengineered HFGs are potential tissue grafts for hair regenerative medicine because they can replicate interactions and hair follicle morphogenesis after transplantation.



Contents lists available at ScienceDirect
Acta Biomaterialia
journal homepage: www.elsevier.com/locate/actbio
ELSEVIER

Full length article

Bioprinting of hair follicle germs for hair regenerative medicine☆

Ayaka Nanmo[a], Lei Yan[a], Tomoki Asaba[a], Licheng Wan[b], Tatsuto Kageyama[a,b,c], Junji Fukuda[a,b,*]

Extracorporeal Shock Wave Therapy

AGA

Extracorporeal Shock Wave Therapy

- **Study Design:** Prospective, noncontrolled (20 women, 8 sessions over 4 weeks)
- **Key Results:**
  Total Hair Count: 8.9% increase ($p < 0.00001$)
  Cumulative Hair Thickness: 8.0% increase
  Patient Feedback: 85% reported improved hair volume
- **Mechanism**
  Mechanotransduction of acoustic waves stimulates neoangiogenesis and growth factor release (e.g., VEGF)
- **Limitations**
  Nonrandomized, no true control group
- **Conclusion**
  ESWT shows **significant improvements** in hair density and quality for FPHL.

Skin Research & Technology
Forward Series
ORIGINAL ARTICLE | Open Access

Shock Waves for Hair Growth and Regeneration in Patients With Female Pattern Hair Loss

Pablo Naranjo García, Rodolfo López Andrino

First published: 03 October 2024 | https://doi.org/10.1111/srt.70064

AGA

Extracorporeal Shock Wave Therapy

ESWT had precedence in dermatology for improving burn scar appearance/contractures and reducing pain

AGA

Extracorporeal Shock Wave Therapy

ESWT had precedence in dermatology for improving chronic non-healing wounds

ELSEVIER

Ultrasound in Med. & Biol., Vol. 34, No. 8, pp. 1261–1271, 2008

0301-5629/08/$–see front matter

doi:10.1016/j.ultrasmedbio.2008.01.010

● *Original Contribution*

EXTRACORPOREAL SHOCK WAVE THERAPY FOR MANAGEMENT OF CHRONIC ULCERS IN THE LOWER EXTREMITIES

R. Saggini,* A. Figus,† A. Troccola,† V. Cocco,* A. Saggini,* and N. Scuderi†

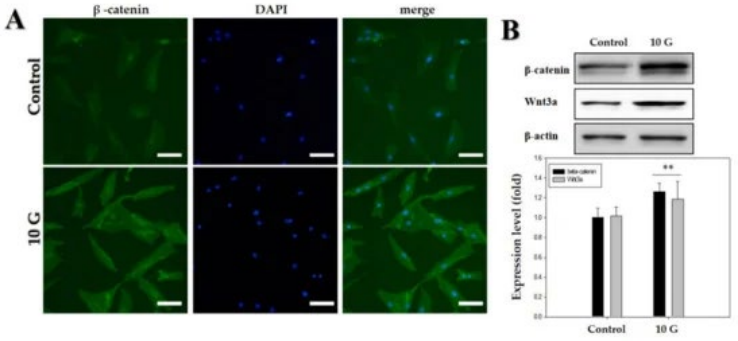
Pulsed Electromagnetic Field (PEMF)

AGA

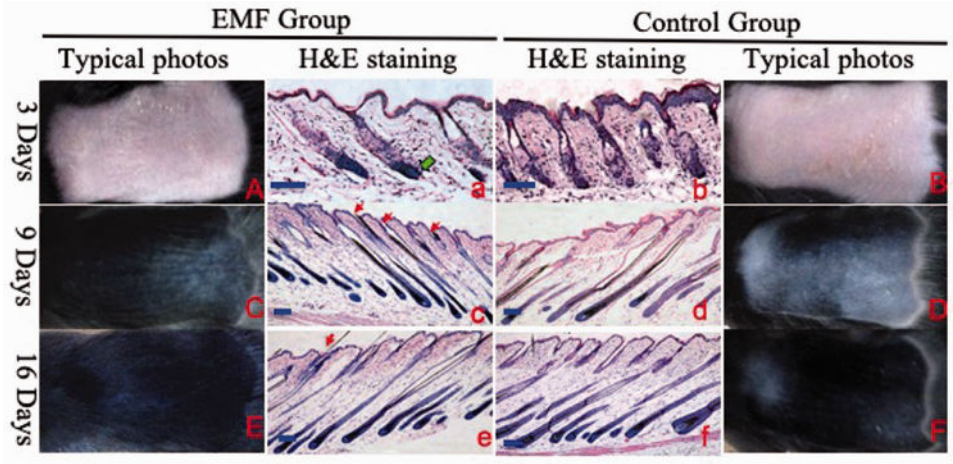
Pulsed Electromagnetic Field (PEMF)

- Electromagnetic field is non-toxic
- Enhances the activation and proliferation of dermal papilla cells in the human hair follicle
  - Upregulation of Wnt3a/beta-catenin signaling**
- During chemotherapy, patients exposed to electric stimulation manifest **effective hair retention, and overcome chemotherapy-induced hair loss**
- 50 Hz electromagnetic field leads to an increase in hair length in hair follicle cycling models

Upregulation of Wnt3α/β-catenin pathway in human DPCs



EMFs induce HF growth in depilated C57BL/6 mice



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Exposure to 50 Hz electromagnetic fields enhances hair follicle regrowth in C57BL/6 mice

Xinping Li, Xin Wang, [...], and Mingsheng Zhang (+2) View all authors and affiliations

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Open Access Article

Extremely Low-Frequency Electromagnetic Fields Increase the Expression of Anagen-Related Molecules in Human Dermal Papilla Cells via GSK-3β/ERK/Akt Signaling Pathway

by Ga-Eun Ki, Yu-Mi Kim, Han-Moi Lim, Eun-Cheol Lee, Yun-Kyong Choi and Young-Kwon Seo *

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BRIEF REPORT

PULSED ELECTROSTATIC FIELDS (ETG) TO REDUCE HAIR LOSS IN WOMEN UNDERGOING CHEMOTHERAPY FOR BREAST CARCINOMA: A PILOT STUDY

BENJI BENJAMIN[a], DANUTE ZIGINSKAS[a], JOHN HARMAN[a] and TIMOTHY MEAKIN[b,*]

AGA

Pulsed Electromagnetic Field (PEMF)

- **Study Design:** Prospective, double-blind, placebo-controlled sham device (80 adults, 24 weeks)
- **Treatment Group:** PBMT + PEMF device (laser diodes emitting wavelengths of 660 nm (80 mW), 808 nm (50 mW) and PEMF at electromagnetic frequencies of 76.6 Hz and 60 Hz)
- **Frequency:** every week for the first 12 weeks, every other week for the next 8 weeks, and just one visit at 4 weeks after the last treatment
- **Key Results:**
  Hair Density: significantly greater increase with treatment device vs sham device ($p < 0.00001$)
  No Serious Adverse Reactions
- **Limitations**
  Not PEMF monotherapy (PBMT included)

TABLE 2. Change in hair density

Hair density Per cm^2	Treatment device (n = 35)	Sham device (n = 36)	95% two-sided CI
	Mean (SD)	Mean (SD)	
Baseline	114.57 (28.75)	113.31 (30.07)	
At 23 weeks	139.37 (31.4)	119.78 (31.92)	
Percent increase(%)	23.93 (20.45)	6.15 (9.51)	(10.13, 25.43)*

* p-value: 0.03325.

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ORIGINAL ARTICLE | Open Access

The efficacy and safety of the combination of photobiomodulation therapy and pulsed electromagnetic field therapy on androgenetic alopecia

Mi Soo Choi MD, Byung Cheol Park MD, PhD

Conceptualizing Growing Hair

AGA/CIA

AA

LPP/FFA/CCCA

Regeneration

- Minoxidil
- Growth Factors
- Stem Cells
- Oxygenation
- Vitamins*

Reduce DHT

- 5-AR inhibitors
- Reduce microvascular insufficiency
  - Botulinum toxin (alleviate pressure from frontalis muscle)

Reduce Inflammation

- Anti-inflammatory medications (i.e. steroids, TCIs, JAK inhibitors, HCQ, PDE4i, MMF, etc.)
- Growth Factors
- Stem Cells
- Light/laser therapies

Target Scarring/ Collagen Remodeling

- Retinoids
- Growth Factors
- Stem Cells
- Light/laser therapies
- Botulinum toxin

THANK YOU!

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