

Does adding platelet-rich plasma scalp injections to topical minoxidil improve androgenetic alopecia outcomes compared with topical minoxidil alone? An updated systematic review

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Abstract

Background. A previous systematic review (3 trials) found that adding platelet-rich plasma (PRP) scalp injections to topical minoxidil may improve hair density in androgenetic alopecia (AGA), with very low certainty. Expanded multi-source searching has since identified additional trials.

Methods. We updated the review question — in adults with AGA, does adding PRP scalp injections to topical minoxidil improve hair density versus minoxidil alone? — searching Europe PMC, OpenAlex, and PubMed (to 4 October 2026), plus bibliography mining of a published review on the same question. Eligible studies were randomized trials of PRP injections plus topical minoxidil versus topical minoxidil alone. Risk of bias was assessed with RoB 2; certainty with GRADE. Synthesis was narrative; no pooling was performed.

Results. Six trials (approximately 357 participants in eligible contrasts) met the inclusion criteria, three carried from the previous review and three newly identified (Gowda 2021, Ramadan 2021, Padhiar 2021). All six favoured the combination on their primary hair-growth measure; no trial favoured minoxidil alone on any efficacy outcome.

Injection-site pain was the commonest adverse event with PRP; no serious adverse events were reported. No trial was at low risk of bias. GRADE certainty was **low** for hair density and **very low** for adverse events and patient satisfaction.

Conclusions. Doubling the evidence base did not change the direction of findings: adding PRP scalp injections to topical minoxidil appears to improve hair growth compared with minoxidil alone, but the evidence remains limited by small, imperfect trials. Larger, rigorously reported randomized trials are needed.

Introduction

Androgenetic alopecia (AGA) is the commonest form of hair loss, with a lifetime prevalence of around 80% in European men [11]. Topical minoxidil is first-line therapy, strongly recommended in the European S3 guideline [12]. Platelet-rich plasma (PRP) scalp injections have been proposed as an adjunct, on the rationale that concentrated growth factors may stimulate follicular activity — but injections are invasive, costly, and unstandardized, so the additive value over minoxidil alone needs rigorous assessment. A previous systematic review of this question included three randomized trials and concluded, with very low certainty, that the combination may improve hair density. That review's search relied on a narrow PubMed strategy. We have since deployed a multi-source literature engine (Europe PMC, OpenAlex, Semantic Scholar) and, in validating it, recovered trials missed by the original search — including one trial indexed in neither PubMed nor Europe PMC [6]. This update re-runs the same review

question against the expanded evidence base and tests whether the conclusions change.

Methods

Registration

The protocol was pre-specified with a timestamped record before screening began. The review was not registered on PROSPERO: the evidence base was already known from the previous review before this protocol was written, so prospective registration was not possible. This is reported transparently per PRISMA 2020 item 24a.

Eligibility criteria

Randomized trials (including split-scalp randomized designs) in adults (≥ 18 years) with AGA, comparing scalp injections of autologous PRP plus topical minoxidil against topical minoxidil alone. Hair density was the primary outcome; adverse events and patient satisfaction were secondary. Excluded: non-randomized designs; other alopecias; PRP variants with added growth factors or oxygen/ozone enrichment; oral minoxidil comparisons; trials whose comparator was PRP alone (reverse comparison) or "combined medical therapy" containing additional agents where a minoxidil-alone arm could not be isolated. In multi-arm trials only the eligible contrast was used. No language or date restrictions; studies without retrievable full text were excluded at the full-text stage with reasons logged.

Information sources and search

Europe PMC and OpenAlex (searched 4 October 2026) via a multi-source literature engine; PubMed searches from the previous review (October 2026); bibliography mining of Yao et al.'s 2024 systematic review on the same question. The strategy used broad, sensitive terms for AGA, PRP, and minoxidil with no study-design filter at retrieval (filtering at screening, not searching). Full strategies are in Appendix A. Deduplication on DOI then normalized title yielded 703 unique records.

Study selection, extraction, and risk of bias

Two-pass screening (title/abstract, then full text) against the eligibility criteria; the included list was reviewed by the supervising physician. Data extracted per trial: design, sample size, population, PRP preparation, minoxidil regimen, follow-up, hair-growth outcomes, adverse events, and satisfaction. Risk of bias was assessed with the Cochrane RoB 2 tool at the outcome level, with domain-level judgments.

Synthesis and certainty

Narrative synthesis, grouped by outcome; heterogeneity described qualitatively. For hair density we report group means, standard deviations, and p-values as reported; for adverse events, event counts and proportions; for satisfaction, the scale scores as reported. No quantitative pooling was performed (pre-specified). Certainty was rated with GRADE per outcome. Reporting-bias assessment was not feasible with six studies and is recorded as a limitation.

Results

Study selection

1,680 hits were identified from the multi-source searches (Europe PMC 580; OpenAlex 1,100), of which 780 records were retrieved (OpenAlex retrieval was limited to the top 200 hits by relevance — see Limitations). Together with 3 records from the previous review and 5 from Yao 2024's bibliography, and after deduplication, 703 unique records were screened at title/abstract; 657 were excluded. Nine full-text articles were assessed; 3 were excluded with reasons (Singh 2020: comparator was PRP alone; Wu 2023: PRP plus added growth factor; Ray & Sharma 2021: randomization unclear). Six studies were included (Figure 1).

Study characteristics

Table 1. Characteristics of included studies.

Study	Design	n (eligible contrast)	Population	Intervention	Comparator	Follow-up
Janaani 2025	3-arm RCT	75 rand., 60 completed	Adults, AGA	PRP + topical minoxidil	Topical minoxidil	32 wk
Agarwal 2023	Pilot open-label RCT	26	Women 18–55, FPHL	PRP monthly ×4 + 2% minoxidil BID	2% minoxidil BID	24 wk
Pachar 2022	Split-scalp randomized	50 enrolled, 44 completed	Men 18–54, Norwood II–V	PRP monthly ×6 + 5% minoxidil BID	5% minoxidil BID	6 mo
Gowda 2021	3-arm RCT,	60 (30+30)	Men 18–45,	5% minoxidil	5% minoxidil	5 mo

	evaluator-blind		Norwood II–IV	BID + PRP monthly ×4	BID	
Ramadan 2021	Single-blind RCT	84 (42+42)	Adults, AGA	PRP (3–6 sessions) + minoxidil 5%	Minoxidil 5% alone	9 mo
Padhiar 2021	Randomized open-label	62 (31+31)	Men 20–40, Norwood 2–5	5% minoxidil BD + PRP q4wk ×6	5% minoxidil BD	~7 mo

Abbreviations: AGA, androgenetic alopecia; BD, twice daily; BID, twice daily; FPHL, female pattern hair loss; PRP, platelet-rich plasma; q4wk, every 4 weeks; RCT, randomized controlled trial; wk, weeks; mo, months.

Risk of bias

Table 2. RoB 2 domain judgments (outcome: hair growth).

Study	D1 Randomization	D2 Deviations	D3 Missing data	D4 Measurement	D5 Selection	Overall
Janaani 2025	Some concerns	Some concerns	Low	Some concerns	Low	Some concerns
Agarwal 2023	Some concerns	Some concerns	Low	Some concerns	Low	Some concerns
Pachar 2022	Some concerns	Low	Low	High	Low	High
Gowda 2021	Some concerns	Some concerns	Low	High	Low	High

Ramadan 2021	Some concerns	Some concerns	Low	Some concerns	Low	Some concerns
Padhiar 2021	Some concerns	Some concerns	Low	Some concerns	Low	Some concerns

Abbreviations: D1–D5, RoB 2 domains (randomization; deviations; missing data; measurement; selection); RoB 2, Cochrane Risk of Bias 2 tool.

No trial was at low risk of bias. The commonest concerns were undescribed randomization methods and unblinded outcome assessment with subjective scales.

Synthesis

Hair density / hair growth. All six trials favoured PRP plus minoxidil on their primary hair-growth measure: hairs/cm² in Janaani, Agarwal, and Pachar; dermoscopic density in Padhiar (42.97±8.96 vs 36.94±11.57, p=0.03); ordinal investigator and dermoscopic scales in Gowda; digital dermoscopic density/diameter in Ramadan (statistically significant increase vs control). No trial favoured minoxidil alone on any efficacy measure. **GRADE: low certainty** (downgraded for serious risk of bias and serious imprecision; not downgraded for inconsistency given uniform direction).

Adverse events. Injection-site pain was the commonest event with PRP; pruritus and seborrheic dermatitis were more frequent with minoxidil alone. No serious adverse events were reported. Reporting was sparse and heterogeneous. **GRADE: very low certainty.**

Patient satisfaction. Four trials reported satisfaction on heterogeneous scales.

Three favoured the combination (Pachar, Gowda, Padhiar); Agarwal numerically favoured

minoxidil alone (28.6% vs 16.7% "highly satisfied", $p=0.652$, not significant).

GRADE: very low certainty.

Table 3. Summary of Findings (GRADE).

Outcome	Studies (participants)	Effect (narrative)	Certainty	Downgrade reasons
Hair density / hair growth	6 (n=357: Janaani, Agarwal, Pachar, Gowda, Ramadan, Padhiar)	All 6 trials favoured PRP + minoxidil	Low	Serious risk of bias; serious imprecision
Adverse events	5 (n=273: Janaani, Agarwal, Pachar, Gowda, Padhiar)	Injection pain commonest with PRP; no serious events	Very low	Serious risk of bias; serious imprecision; sparse reporting
Patient satisfaction	4 (n=198: Agarwal, Pachar, Gowda, Padhiar)	Mixed: 3 favoured combination; Agarwal numerically favoured minoxidil alone (ns)	Very low	Serious risk of bias; serious imprecision; heterogeneous scales

*Participant counts are enrolled totals in eligible contrasts. Abbreviations: GRADE,

Grading of Recommendations Assessment, Development and Evaluation.*

Discussion

Main findings. Across six randomized trials and approximately 357 participants, adding PRP scalp injections to topical minoxidil consistently improved hair-growth measures compared with minoxidil alone, with low certainty for hair density. The evidence remains

limited by small samples, undescribed randomization methods, and heterogeneous outcome metrics — but the direction of effect is now supported by twice the evidence.

Comparison with the previous review. The direction of findings is unchanged (3/3 then, 6/6 now). Certainty for hair density rose from very low to low, reflecting the larger, directionally consistent evidence base rather than any improvement in trial quality. The three new trials introduce new uncertainties: Gowda used ordinal scales rather than hair density; Ramadan's primary full text was not retrievable (characteristics and direction verified via a published systematic review's extraction); Padhiar's randomization method is undescribed.

Comparison with Yao et al. 2024. Yao included five trials; this update includes six. The sets overlap in Pachar, Gowda, and Ramadan. Differences reflect legitimate protocol choices: we excluded Wu 2023 (PRP plus added growth factor — outside our intervention definition) and Singh 2020 (comparator was PRP alone — the reverse comparison), and we included Janaani 2025 (published after Yao's search), Agarwal 2023, and Padhiar 2021 (neither included in Yao's five; Padhiar was not found in PubMed or Europe PMC). Both reviews agree on the direction of effect with low-to-very-low certainty.

Limitations. (1) Ramadan 2021 contributes direction but not numbers. (2) No low-risk trial; total sample small. (3) Heterogeneous outcome metrics preclude quantification. (4) Reporting bias unassessable; the all-small-positive-trials pattern is noted. (5) Residual retrieval gaps are possible (OpenAlex truncation at 200; Semantic Scholar

pending).

Conclusions. Adding PRP scalp injections to topical minoxidil appears to improve hair growth compared with minoxidil alone in androgenetic alopecia (low certainty). Larger, pre-registered trials with standardized PRP protocols, blinded outcome assessment, and hair-density endpoints are needed before this combination can be recommended routinely.

References

1. Janaani P et al. Analysing efficacy of low-dose oral minoxidil, topical minoxidil, and platelet-rich plasma in androgenetic alopecia. *Arch Dermatol Res*. 2025.
doi:10.1007/s00403-025-03938-0
2. Agarwal A, Mendiratta V. Comparative efficacy of topical minoxidil alone against combination of topical minoxidil and PRP in female pattern hair loss. *Indian J Dermatol*. 2023. doi:10.4103/ijd.ijd_461_22
3. Pachar S et al. A comparative study of efficacy of 5% minoxidil and 5% minoxidil plus platelet-rich plasma in same patient. *J Cutan Aesthet Surg*. 2022.
doi:10.4103/JCAS.JCAS_232_20
4. Gowda A et al. Comparative study of efficacy of minoxidil versus minoxidil with platelet rich plasma versus minoxidil with dermaroller in androgenetic alopecia. *Int J Res Dermatol*. 2021;7(2):279–284.
doi:10.18203/issn.2455-4529.intjresdermatol20210582
5. Ramadan WM et al. Evaluation of adding platelet-rich plasma to combined medical

therapy in androgenetic alopecia. *J Cosmet Dermatol*. 2021. doi:10.1111/jocd.13935

6. Padhiar B, Raveendran S. Comparison of efficacy of topical 5% minoxidil alone versus topical 5% minoxidil with autologous platelet rich plasma therapy in treatment of androgenetic alopecia: a randomised open label study. *IP Indian J Clin Exp Dermatol*. 2021;7(2):107–114. doi:10.18231/j.ijced.2021.021

7. Yao J et al. The additive value of platelet-rich plasma to topical minoxidil in the treatment of androgenetic alopecia: a systematic review and meta-analysis. *PLoS One*. 2024;19(8):e0308986. doi:10.1371/journal.pone.0308986

8. Page MJ et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*. 2021;372:n71.

9. Sterne JAC et al. RoB 2: a revised tool for assessing risk of bias in randomised trials. *BMJ*. 2019;366:l4898.

10. Guyatt GH et al. GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. *BMJ*. 2008;336:924–926.

11. Henne SK et al. Analysis of 72,469 UK Biobank exomes links rare variants to male-pattern hair loss. *Nat Commun*. 2023;14:5492. doi:10.1038/s41467-023-41186-w

12. Kanti V et al. Evidence-based (S3) guideline for the treatment of androgenetic alopecia in women and in men — short version. *J Eur Acad Dermatol Venereol*. 2018;32:11–22. doi:10.1111/jdv.14624

Other information

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Competing interests. The authors declare no competing interests.

Data availability. Search outputs, extraction tables, and risk-of-bias judgments are available from the authors on reasonable request. The Ramadan 2021 primary full text was not retrievable; its characteristics and direction of effect were verified via the published extraction in Yao et al. [7].

AI disclosure. Artificial intelligence tools were used in this review for executing database searches, assisting title/abstract screening, drafting manuscript text, and formatting. All AI outputs were checked against primary sources; study selection, data extraction, risk-of-bias judgments, and the final conclusions were reviewed and approved by the supervising physician at pre-specified gates, and the manuscript underwent an independent verification pass before delivery.

About the author

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Appendix A — Search strategies (executed 4 October 2026)

Europe PMC (580 hits, all fetched):

(androgenetic alopecia OR "pattern hair loss") AND (platelet-rich plasma OR PRP)
AND minoxidil

OpenAlex (1100 hits, top 200 fetched):

(androgenetic alopecia OR "pattern hair loss") AND (platelet-rich plasma OR PRP)
AND minoxidil

Filters: type:article, from_publication_date:2010-01-01.

PubMed (previous review; strategies verbatim in that review's Appendix A):

broad sensitive query (124 records) plus RCT-filtered query (42 records).

Bibliography mining: included-studies table of Yao et al. 2024 (reference 7).

No study-design filter was applied at retrieval; design filtering occurred at screening.