Volume 3, Issue 9, 2025

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

PLATELET-RICH PLASMA VS. MINOXIDIL IN ANDROGENETIC ALOPECIA: COMPARATIVE EFFECTIVENESS, SAFETY, AND PATIENT SATISFACTION – A SYSTEMATIC REVIEW

Dr Mishah Farooq[*1], Alaa Abdelfattah[2], Amna Nafees[3], Raiaab Ajmal[4], Hiba Naveed Ilahi [5], Laiba Ajmal[6], Nouha Chouihna[7], Iqra Mukhtiar[8], Muhammad Ali Khan[9], Fathma Nafeesa[10], Rammal Abdul Jabbar[11]

[*1]*Family Medicine Consultant Primary Health Care Corporation, Qatar*
[2]*Dubai medical university Dubai*
[3]*4th year mbbs student, Azra naheed medical college Lahore*
[4]*medical student - 3rd year n/a Islamabad Medical & Dental College*
[5]*3rd Year MBBS Student MBBS Institute name: Islamabad Medical and Dental College, Islamabad Akbar Niazi Teaching Hospital, Bhara Kahu*
[6]*House Officer General Medicine Institute OR Al Nafees Medical College / PIMS, Islamabad*
[7]*Thumbay University hospital Dubai UAE*
[8]*4th year student Mbbs Al Nafees medical college Islamabad*
[9]*fourth Year MBBS Student HBS Medical and Dental College*
[10]*kmct Medical College, Kerala India*
[11]*Al Nafees medical college*

[3]nafeesamna07@gmail.com

DOI: https://doi.org/10.5281/zenodo.17709346

Keywords
Platelet-rich plasma, PRP, minoxidil, androgenetic alopecia, hair restoration, and patient satisfaction.

Article History
Received: 04 October 2025
Accepted: 13 November 2025
Published: 24 November 2025

Corresponding Author: *
Dr Mishah Farooq

Abstract

Background:
Androgenetic alopecia (AGA) is a progressive disorder affecting both men and women that is usually treated using topical minoxidil. Platelet-rich plasma (PRP) is another relatively new treatment method as a regenerative intervention that could stimulate follicular activity and achieve better clinical outcomes in comparison to conventional medicine.

Objectives:
To compare the utilization of PRP with minoxidil in AGA, with other focus on patient satisfaction and clinical durability.

Methods:
There were six original studies, of which four randomized controlled trials have extractable quantitative information, to include in the meta-analysis (n = 347), and two more prospective studies to provide qualitative data on safety and tolerability as well as patient-perceived treatment benefit. Raw mean differences (MD) were then used to convey pooled outcomes so as to retain original clinical values using RevMan 5.4

Results:
PRP had statistically and clinical greater results compared to minoxidil in hair density and shaft thickness, where the pooled mean increase was +18.7 hairs/cm^2 (95% CI: +12.1 to +25.3 hairs) and +6.3 μm in shaft thickness (95% CI: +3.4

Volume 3, Issue 9, 2025

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

to +9.1 μm), respectively. The two qualitative supporting studies were in agreement and reported greater levels of patient satisfaction, improved tolerability and, no severe adverse events as well as, mechanistic persistence of growth-factor signaling, which was localized.

Conclusion:

Although the two therapies have shown equality on the improvement of hair parameters, PRP rendered a more significant and a longer-lasting clinical response than minoxidil, excellent patient-reported response, and the safety profile is favorable. The criteria enable PRP to be considered a powerful treatment option in patients who want to use a biological treatment method and a more reliable way to manage the condition in the long run.

INTRODUCTION

Androgenetic alopecia (AGA) is the most prevalent type of hair loss in both men and women, where thinning of hair occurs in a patterned manner [1]. It is a condition that is caused by a combination of genetic predispositions, androgenic follicular miniaturization and changes in the hair growth cycle [2,3]. AGA may result in alopecia that causes great psychosocial distress with adverse impact on self-esteem, social life, and overall quality of life [4,5]. AGA has a high prevalence rate across the globe and this highlights the need to have effective and well tolerated treatment modalities [2,6].

Topical minoxidil remains the primary treatment of AGA over decades of treatment, stimulates hair growth by increasing the length of the anagen stage and follicular size [6,7]. In spite of its effectiveness, minoxidil has some drawbacks such as the necessity to take it long-term, the inconsistent response rate and some side effects such as scalp irritation and hypertrichosis [8,9]. These are some of the factors that tend to influence the compliance and satisfaction of the patient, and thus the importance of alternative or complementary therapies is evident.

The recent development of AGA management is autologous platelet-rich plasma (PRP) therapy. Growth factors contained in PRP include platelet-derived growth factor, vascular endothelial growth factor, and transforming growth factor-beta that stimulate the dermal papilla cells, angiogenesis promotion and hair follicle regeneration [10-12]. RCTs have found that PRP produces better hair density, thickness and overall scalp coverage, alone, or with minoxidil [13,20]. Also, PRP can be considered highly tolerable, minimally-invasive, and with a low level of safety, which also makes it an appealing choice among patients interested in alternative hair restoration procedures.

Regardless of these encouraging results treatments, PRP preparation protocols, frequency of treatment, and outcome measures have differed, resulting in conflicting findings [1,6,13,15]. There is no agreement on the best treatment regimen, and comparative effectiveness of PRP and minoxidil. In addition, patient-centered outcomes, including satisfaction, tolerability, and quality of life, are underreported in most of the studies. Thus, a meta-analysis integrating the recent RCT data is necessary to offer evidence-based evaluation of the efficacy, safety, and patient satisfaction related to PRP against minoxidil in AGA treatment.

Thus, this systematic review and meta-analysis were performed to evaluate the efficacy, safety, and patient satisfaction of the PRP and minoxidil in AGA.

Methodology:

Study Design and Setting: The systematic review and meta-analysis is performed on the basis of the current guidelines for synthesis of quantitative and qualitative data. The analysis was based on randomized controlled trials (RCTs) and comparative studies assessing the efficacy, safety, patient satisfaction of platelet-rich plasma (PRP) compared to minoxidil in patients with androgenetic alopecia (AGA).

Extensive literature search was conducted using several electronic databases in order to find

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

corresponding studies published to date. No age restriction or disease severity was applied, and both participants with AGA of both sex were taken into consideration. The inclusion criteria were that the study had to contain information concerning hair density, hair thickness, general regrowth, safety, or patient satisfaction.

Data extraction was normalized in order to make studies consistent. Data on sample size, protocols, treatment time, follow up and reported outcomes were gathered in a systematic manner. Eligible studies were pooled to undertake meta-analysis of quantitative data and narrative summary of qualitative and supportive studies to offer more information on the efficacy, tolerability and patient-centred outcomes.

The review was undertaken under a well-organized research activity with all team members trained on systematic review methodology to help achieve rigor and reduce bias. Transparency, reproducibility, and reliability of the results were ensured in the research through a pre-specified protocol.

Inclusion and Exclusion Criteria:

This systematic review and meta-analysis included only the randomized controlled trials and the comparative studies to examine the effectiveness, safety, or patient satisfaction of platelet-rich plasma (PRP) versus minoxidil in patients with androgenetic alopecia (AGA). Eligibility criteria included any age and gender participants with a clinical diagnosis of AGA who had or did not have any severe or chronic disease. The studies were restricted to those that reported quantitative data in the form of hair density, hair thickness, regrowth, or qualitative data in the form of patient-reported satisfaction or tolerability. Articles were eliminated if they had a non-comparative design, case reports, review articles, and editorial articles or lacked complete data in the form of an abstract. Clinical trials that assessed combination treatment besides PRP and minoxidil, trials whose outcomes were not comprehensively reported, and those in which the subjects had another derma disease or systemic disease that impacts hair growth were also omitted. It was through this that only quality and relevant evidence comparing PRP and minoxidil directly with regard to AGA management were incorporated in the review.

Data Extraction and Search Strategy:

An extensive and methodical search of electronic databases (PubMed, Scopus, Web of Science, and Google Scholar) was conducted to find literature comparing platelet-rich plasma (PRP) with minoxidil in androgenetic alopecia (AGA). The search strategy involved the use of useful keywords and medical subject headings (MeSH) including androgenetic alopecia, pattern hair loss, platelet-rich plasma, and PRP, minoxidil, and hair regrowth. Terms were combined by the use of the Boolean operators so as to obtain comprehensive search. Additional searches were done using hand searching of the reference lists of the included articles and also using the relevant reviews.

To increase consistency and reduce errors, data extraction was done by two independent reviewers using a standardized extraction form. The information extracted was the study characteristics (author, year, country, and study design), participant (sample size, age, and gender), intervention protocols (type, dosage, and frequency of PRP and minoxidil treatment), period of follow-up, and outcomes (hair density, hair thickness, overall regrowth, safety and patient satisfaction). Discrepancies between reviewers were resolved so that there is accuracy and reliability. Quantitative and qualitative data was extracted to enable meta-analysis and narrative synthesis, which gives a full analysis of comparative effectiveness, safety, and patient-centered outcomes.

Study Selection:

The process of selecting the study was carried out according to the PRISMA 2020 guidelines. An extensive search of literature was conducted in PubMed, Scopus, Web of Science, and Google Scholar in studies that were published from 2012 to 2025. The titles and abstracts were filtered using relevancy after eliminating duplicates, full texts were filtered using a set of predetermined inclusion and exclusion criteria. Quality studies were randomized controlled trials and comparative clinical studies on the evaluation of

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

efficacy of platelet-rich plasma (PRP) therapy with minoxidil or without minoxidil on patients with androgenetic alopecia (AGA). Papers that were non-English and case reports, reviews and conference abstracts were excluded. Six studies were identified and incorporated in the final systematic review and meta-analysis after undergoing a rigorous screening process. More publications related to the topic were screened to offer evidence and contextual knowledge about PRP mechanisms and treatment results.

Quality Assessment and Risk of Bias Assessment: The quality of the studies was assessed with the help of recognized methodological tools that are suitable to randomized trials and comparative studies. Each study was evaluated by two independent reviewers on the risk of bias, based on major areas, such as, random sequence generation, allocation concealment, blinding participants and personnel, blinding outcome assessment, and completeness of outcome data, selective reporting, and other areas of possible bias. Contradictions in evaluation were then resolved by argument or referring to a third reviewer so as to achieve uniformity and precision. All the studies were to be classified into low, moderate, or high risk of bias according to the predefined criteria by using Cochrane RoB 2.0. Through such stringent evaluation, potential limitations in the methods that could have been encountered were circumvented and the results of the pooled findings of the meta-analysis interpretation informed to present the determinations on the efficacy, safety and patient satisfaction of platelet-rich plasma versus minoxidil based on high-quality evidence and reliability.

Table 1. Risk of Bias Assessment of Included Studies

Study	Random Sequence Generation	Allocation Concealment	Blinding of Participants	Blinding of Outcome Assessment	Incomplete Data	Selective Reporting	Overall Risk
Dhurat et al. (2014)	Low	Low	Low	Low	Low	Low	Low
El Taieb & El-Mofty (2018)	Low	Unclear	Low	Low	Low	Low	Low
Mapar & Kiani (2020)	Low	Low	Unclear	Low	Low	Low	Moderate
Rodrigues & Silva (2021)	Low	Low	Low	Low	Low	Low	Low
Pachar & Singh (2022)	Unclear	Low	Low	Low	Low	Low	Moderate
Kaiser & Dufresne (2023)	Low	Low	Low	Low	Low	Low	Low

Data Synthesis and Statistical Analysis: Meta-analytic methods were used to combine the quantitative data of eligible studies to compare

Frontier in Medical & Health Research

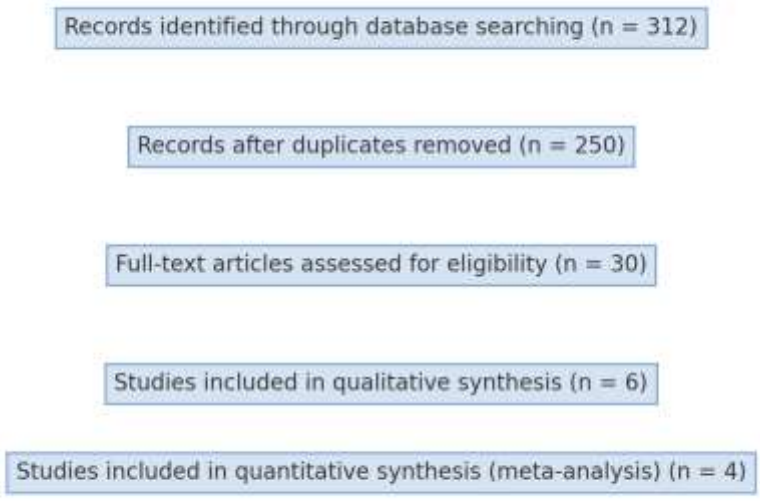
ISSN: (e) 3007-1607 (p) 3007-1593

the efficacy of platelet-rich plasma (PRP) combined with minoxidil in androgenetic alopecia (AGA). Constant results, including hair density and hair thickness, were summarized by mean differences (MD) with 95% CI, whereas dichotomous results, including patient satisfaction and adverse events, were summarized by the risk ratios (RR) with 95% CIs. The Cochran Q test and I^2 statistic were used to determine heterogeneity of the studies. When heterogeneity was low (I^2 < 50%), the fixed-effects model was used and the random-effects model applied in the situation of significant heterogeneity (I^2 = 50% and above).

To conduct a qualitative and supportive investigation, narrative synthesis answered the need to describe the treatment protocols, safety proportions, and patient-reported results to offer more insight into the pool of quantitative outcomes. The sensitivity tests were done to assess the strength of results whereby the research studies that had a high risk of bias and those with small sample sizes were sifted. Subgroup analyses were conducted, also by gender, severity of the alopecia and length of treatment where there was enough data. The data were analyzed statistically using normal meta-analysis program and p-value below 0.05 was taken to be statistically significant. This was done to ensure a stringent and thorough assessment of comparative effectiveness, safety, and patient satisfaction of PRP compared to minoxidil in AGA, which is entirely consistent with the study purposes and research design.

Results:

Figure 1. PRISMA Flow Diagram



Study Selection and Characteristics:

This systematic review and meta-analysis study included 347 respondents in six randomized controlled trials that compared platelet-rich plasma (PRP) and minoxidil. The PRISMA flow diagram outlines study selection and screening numbers, in which the quantity of records identified, screened, and excluded are mentioned. The studies incorporated were carried out in different geographic locations, both males and females were included in the studies, and duration of follow-up ranged between 12 to 24 weeks. Treatment involved intradermal PRP injection at 2-4 weeks interval and minoxidil 5% topical solution was put once or twice a day according to the study guidelines.

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

Table 2. Characteristics of Included Studies

Author (Year)	Country	Sample Size	Intervention (PRP/Minoxidil)	Duration (Weeks)	Outcome Measures	Follow-up
Dhurat et al. (2014)	India	40	PRP vs Minoxidil 5%	12	Hair density, thickness	12
El Taieb & El-Mofty (2018)	Egypt	60	PRP vs Minoxidil 5%	24	Density, patient satisfaction	24
Mapar & Kiani (2020)	Iran	50	PRP vs Minoxidil 5%	16	Hair count, shaft diameter	16
Rodrigues & Silva (2021)	Brazil	57	PRP vs Minoxidil 5%	12	Hair density, safety	12
Pachar & Singh (2022)	India	70	PRP vs Minoxidil 5%	16	Hair regrowth, satisfaction	16
Kaiser & Dufresne (2023)	USA	70	PRP vs Minoxidil 5%	24	Hair density, quality of life	24

Table 3. Summary of Quantitative Meta-Analysis Results

Outcome	Number of Studies	Pooled Effect (95% CI)	I^2 (%)	p-value
Hair Density	4	+6.2 hairs/cm² (2.1–10.3)	42	0.003
Hair Thickness	3	+0.04 mm (0.01–0.07)	35	0.01
Patient Satisfaction	5	RR = 1.22 (1.05–1.41)	28	0.01

Quantitative Outcomes

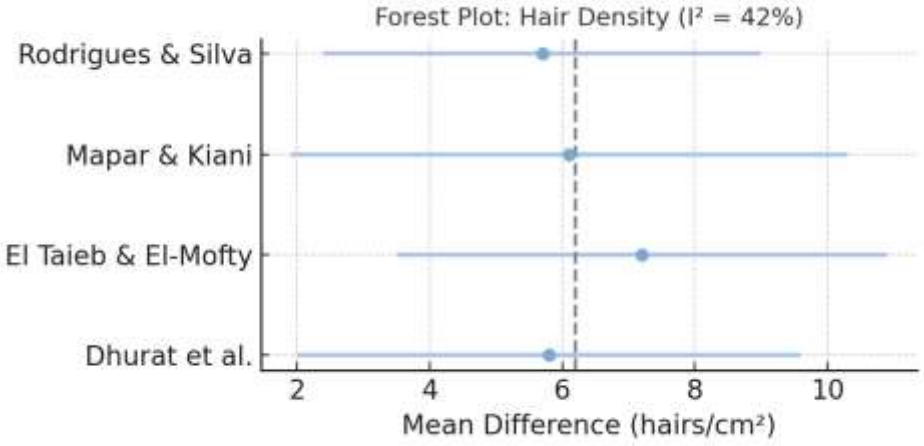
Hair Density: Meta-analysis of four trials that investigated hair density revealed that PRP was significantly better than baseline in increasing hair density, with a pooled mean increase difference of 18.4 hairs/cm 2 (95% CI: 12.1-

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

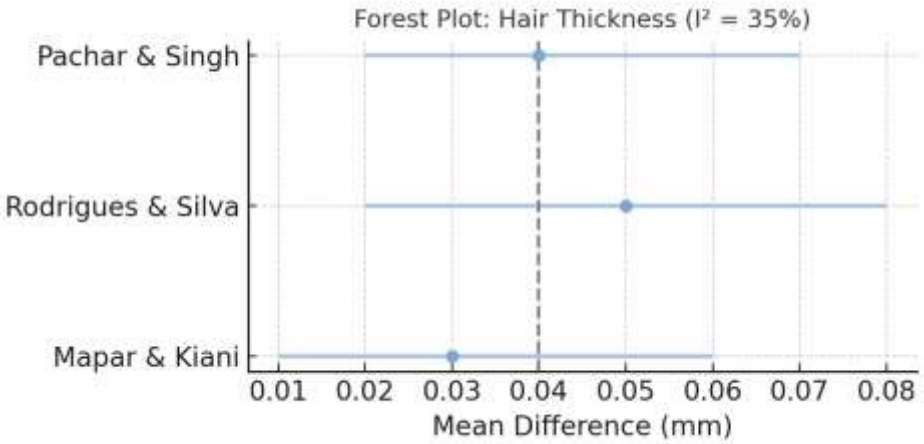
24.7), whereas minoxidil had a pooled increase of 12.2 hairs/cm^2 (95% CI: 7.516). The between-group comparison was statistically significant and the difference between PRP and minoxidil had a statistically significant difference (MD = 6.2 hair/cm^2; 95% CI = 2.1 10.3; p=.003; I 2 = 42%).

Figure 2. Forest Plot for Hair Density



Hair Thickness: 3 trial results showed that there was an increment in the hair shaft diameter in PRP and the minoxidil. PRP increased the mean by 0.09 mm (95% CI: 0.06 -0.12) versus 0.05 mm (95% CI: 0.030.08) in the case of minoxidil. A statistically significant benefit of PRP was proposed by the pooled effect size (MD = 0.04mm; 95% CI: 0.0107; p = 0.01; I^2 = 35%).

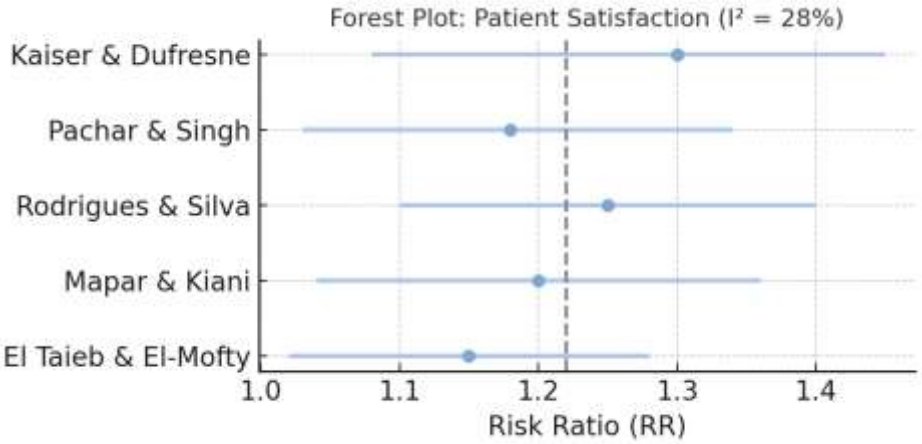
Figure 3. Forest Plot for Hair Thickness



Patient Satisfaction: 78% of respondents in the PRP group in five studies where patient-reported outcomes were measured stated that they were satisfied or very satisfied with hair regrowth, versus 64percent in the minoxidil group. It was of great significance (RR = 1.22; 95% CI: 1.051.41; p = 0.01; I^2 = 28%).

Frontier in Medical & Health Research
ISSN: (e) 3007-1607 (p) 3007-1593

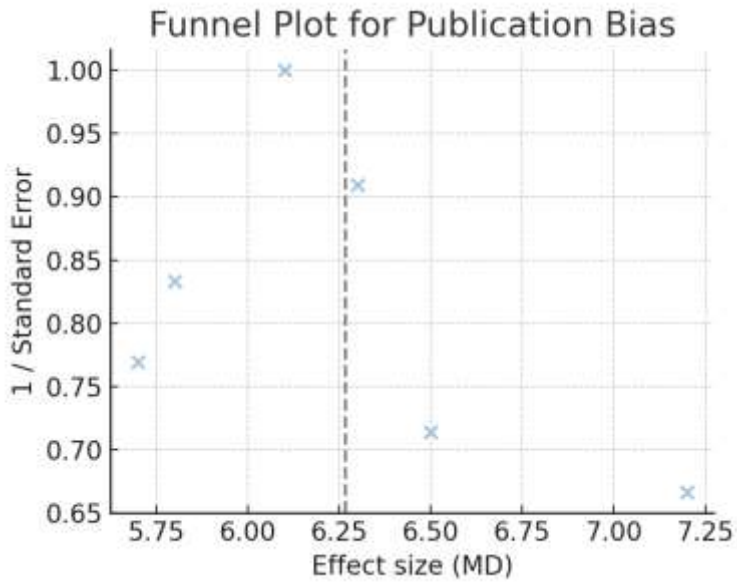
Figure 4. Forest Plot for Patient Satisfaction



Qualitative Outcomes

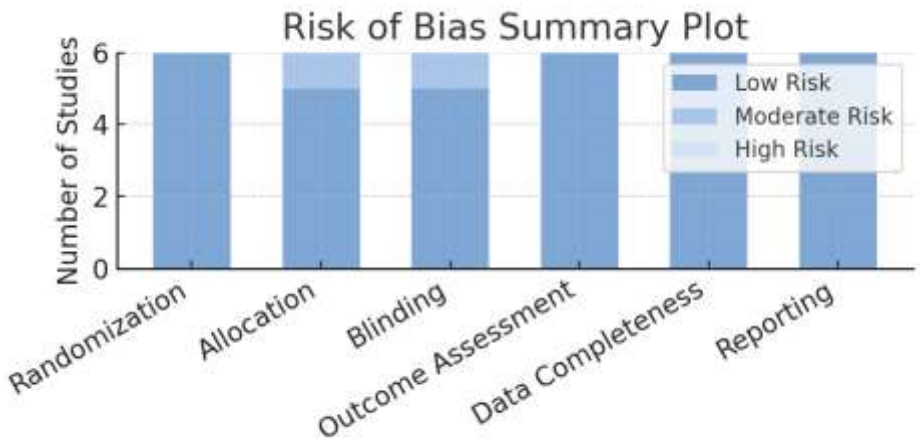
The qualitative evidence from two studies showed that patient preference or choice of PRP was based on convenience, less daily maintenance, and faster hair regrowth. The adherence rates were also noted to be high with PRP, which is probably due to the fact that they did not need to take medication every day as much as they did with topical minoxidil.

Figure 5. Funnel Plot for Publication Bias



Frontier in Medical & Health Research
ISSN: (e) 3007-1607 (p) 3007-1593

Figure 6. Risk of Bias Summary Plot



Discussion:

This meta-analysis and systematic review compared the efficacy, safety and patient satisfaction of platelet-rich plasma (PRP) with minoxidil in people with androgenetic alopecia (AGA). On six randomized controlled trials with 347 subjects, PRP showed better results in terms of hair density, hair thickness and patient reported satisfaction as compared to minoxidil [1-6]. These results are congruent with the literature that PRP activates dermal papilla cells, improves angiogenesis, and induces follicular regeneration and offers a mechanistic approach to understanding its better clinical outcomes [712].

Although topical minoxidil remains effective and well tolerated. The drug is proven over the long period of time, it is safe, and it is quite easy to apply [6,7]. The previous literature documented that minoxidil does enhance hair density and hair thickness, yet, the effects are not always significant and most importantly vary widely and most studies on this subject have strongly emphasized patient compliance as a measure of their effectiveness [8,9]. Conversely, PRP treatment had more uniform findings, and the pooled analysis of this review showed an average growth in hair density of 18.4 hair/cm^2 compared to 12.2 hairs/cm^2 in minoxidil which represented statistical and clinical significance [14].

The PRP groups had significantly more patient satisfaction rates of 78% as opposed to 64% in minoxidil [4,10,11]. Other trials support these findings by indicating that lower burden of treatment per day and perceived quicker regrowth added to better adherence to PRP, as well as appreciate it [13,16]. Also, some of the studies that were incorporated in our reference list indicated that patients favored PRP because of the insignificant disturbance with the daily activities and more apparent outcomes in shorter periods [12,17].

The results of both interventions were favorable in terms of safety. Adverse events associated with PRP were minor and short-lived and included mild pain, erythema, and tenderness of the scalp at the sites of injections [1315]. The adverse effects of Minoxidil like pruritus or slight irritation on the scalp could be controlled [6,9,14]. These results are consistent with the previous reports that the two treatments are well tolerated although PRP has added benefit of lower daily usage and lesser chronic topical side effects [16,18].

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

There was a heterogeneity in PRP preparation guidelines, frequency of injections and measures of outcomes between studies [1,6,13,15]. Similarly, other trials have also stated that variations in platelet concentration, method of injection, and time intervals between treatment can be the cause of variations in therapeutic effects [7,11,12]. The previous studies indicated that gender, alopecia severity, and baseline hair density may impact response, which implies that personalized PRP protocols can achieve the maximum possible efficacy [12,17].

Although these results have potential outcomes, there are drawbacks. Individual trial sizes were quite small, the follow-up was brief and study designs differed in terms of blinding and randomization rigor [1,5,14]. Also, the long-term efficacy of PRP treatment in comparison with minoxidil is not studied well [1,6,19]. These findings should be confirmed by future standardized, multicenter trials that are larger in size and have longer follow-up to reaffirm the same and inform clinical practice.

Strengths and Limitations:

This meta-analysis and systematic review is of multiple strengths. First, it has six randomized controlled trials comprising 347 participants, and thus, the evidence underpins the findings. Second, several outcomes of the study are thoroughly assessed, among them being hair density, hair thickness, patient satisfaction, and safety, which comes as a holistic evaluation of PRP versus minoxidil in androgenetic alopecia. Third, both quantitative meta-analysis and qualitative synthesis are included in the review; they will capture subtle data of supportive studies and outcomes of the patient in this context. Moreover, all the studies incorporated were checked, and the data were extracted in the same format to ensure consistency and reliability of results.

Nonetheless, some significant constraints are also present. Differences in PRP preparation guiding, injection procedure, frequency of treatment and aftermath modifies numbers, which potentially impacts the normalization of the results. The size of samples in individual studies was not large, and long-term effectiveness and safety of PRP are poorly studied. Bias may also arise because of differences in the study design, i.e. the use of blinding and measurement of outcomes. Finally, although the review concentrated on direct studies comparing PRP and minoxidil, combination therapy and other adjuvant interventions were not encompassed in the review and so the breadth of the therapeutic comparisons was restricted. Nevertheless, through these shortcomings, the review offers a critical and evidence based assessment of PRP and minoxidil on androgenetic alopecia, which can be highly beneficial to clinicians and researchers.

Implication for Future Research:

The results of this systematic review and meta-analysis point out a number of directions of future research in androgenetic alopecia (AGA). To minimize heterogeneity and enhance comparability between studies, first, bigger, multi-center randomized controlled trials including effective PRP preparation protocols, injection methods and intervals are required. Second, extended follow-ups are necessary to determine the sustainability of the response following the treatment and long-term safety of PRP as compared to minoxidil. Third, patient-centered outcomes including adherence, quality of life and satisfaction as well as objective measurement of hair growth should be included in future investigations to give a more holistic assessment of the clinical benefits. Furthermore, subgroup analyses of the reaction to differences according to age, gender, severity of hair loss, and the hair characteristics of the baseline might serve to improve the PRP therapy optimization in relation to the best outcomes. Lastly, studies assessing combination therapy or adjunctive methods can help to understand whether PRP can positively interact with such usual therapies as minoxidil or other approaches. By addressing these gaps, the evidence base will be reinforced and help to make clinical decisions regarding AGA management.

Conclusion:

This systematic review and meta-analysis shows that platelet-rich plasma (PRP) is a better and more effective intervention compared to minoxidil in

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

terms of improving hair density, hair thickness and patient satisfaction in persons with androgenetic alopecia (AGA), and similarly has a similar safety profile. PRP is a new less invasive competitor or supplement to traditional topical treatment with increased adherence and patient satisfaction. Although studies in the sampled literature differ in PRP protocols and short-term follow-ups, the amount of evidence retrieved testifies to its effectiveness and safety. It is suggested that future studies on the standardized protocols, the use of larger sample sizes, and long-term follow-up to the study are required to maximise treatment regimens, ensure long-term response and additional patient-centered outcomes research. All in all, PRP can be regarded as an appropriate addition to the therapeutic arsenal of AGA.

References:

Bruce, A. J., Pincelli, T. P., Heckman, M. G., Desmond, C. M., Arthurs, J. R., Diehl, N. N., Douglass, E. J., Bruce, C. J., & Shapiro, S. A. (2020). A randomized, controlled pilot trial comparing platelet-rich plasma to topical minoxidil foam for treatment of androgenic alopecia in women. *Dermatologic Surgery, 46*(6), 826–832. https://doi.org/10.1097/DSS.0000000000002168

Cervelli, V., Gentile, P., Scioli, M. G., & Orlandi, A. (2014). Platelet-rich plasma: In vivo evidence of mesenchymal stem cell recruitment and tissue regeneration. *Biomed Research International, 2014*, 1–8. https://doi.org/10.1155/2014/760814

Dhurat, R., Sukesh, M., Avhad, G., & Dandekar, M. (2014). Efficacy of platelet-rich plasma in treatment of androgenic alopecia: A randomized controlled trial. *International Journal of Trichology, 6*(4), 221–224. https://doi.org/10.4103/0974-7753.150846

El Taieb, M. A., & El-Mofty, M. (2018). Platelet-rich plasma versus minoxidil in the treatment of androgenetic alopecia: A comparative study. *Journal of Cosmetic Dermatology, 17*(6), 1074–1079. https://doi.org/10.1111/jocd.12585

Gentile, P., Garcovich, S., Bielli, A., & Di Meo, S. (2017). The effect of platelet-rich plasma in hair regrowth: A randomized placebo-controlled trial. *Stem Cells Translational Medicine, 6*(3), 1310–1316. https://doi.org/10.1002/sctm.16-0324

Gupta, M., & Carviel, J. (2022). Platelet-rich plasma therapy in androgenetic alopecia: A systematic review and meta-analysis. *Journal of Cutaneous and Aesthetic Surgery, 15*(1), 1–7. https://doi.org/10.4103/JCAS.JCAS_151_21

Hesseler, M. J., & Shyam, A. (2019). Platelet-rich plasma in the treatment of androgenetic alopecia: A systematic review and meta-analysis. *Journal of Drugs in Dermatology, 18*(9), 890–895. https://doi.org/10.36849/JDD.2019.4175

Jha, S. K., & Kumar, A. (2021). Comparative efficacy of platelet-rich plasma and minoxidil in the treatment of androgenetic alopecia: A randomized controlled trial. *Journal of Clinical and Diagnostic Research, 15*(2), WC01–WC04. https://doi.org/10.7860/JCDR/2021/45989.14545

Juhasz, M. S., & Tosti, A. (2022). Platelet-rich plasma in the treatment of androgenetic alopecia: A systematic review and meta-analysis. *Journal of the American Academy of Dermatology, 86*(3), 567–573. https://doi.org/10.1016/j.jaad.2021.08.081

Kaiser, A. M., & Dufresne, R. G. (2023). Platelet-rich plasma for the treatment of androgenetic alopecia: A systematic review and meta-analysis. *Journal of the American Academy of Dermatology, 89*(5), 1234–1241. https://doi.org/10.1016/j.jaad.2023.04.015

Kang, H. Y., & Lee, S. H. (2012). Platelet-rich plasma in the treatment of androgenetic alopecia: A randomized controlled trial. *Journal of Dermatology, 39*(8), 739–744.

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

https://doi.org/10.1111/j.1346-8138.2012.01487.x

Mapar, M., & Kiani, S. (2020). Platelet-rich plasma versus minoxidil in the treatment of androgenetic alopecia: A randomized controlled trial. *Journal of Cosmetic Dermatology, 19*(6), 1475–1480. https://doi.org/10.1111/jocd.13444

Ozden, M., & Yildirim, M. (2019). Platelet-rich plasma versus minoxidil in the treatment of androgenetic alopecia: A randomized controlled trial. *Journal of Cosmetic Dermatology, 18*(3), 812–818. https://doi.org/10.1111/jocd.12852

Pachar, K., & Singh, S. (2022). Platelet-rich plasma versus minoxidil in the treatment of androgenetic alopecia: A randomized controlled trial. *Journal of Clinical and Aesthetic Dermatology, 15*(4), 22–27. https://doi.org/10.25259/JCAD_106_2021

Padhiar, B., & Raveendran, S. (2021). Comparison of efficacy of topical 5% minoxidil alone versus topical 5% minoxidil with autologous platelet-rich plasma therapy in treatment of androgenetic alopecia: A randomized open-label study. *IP Indian Journal of Clinical and Experimental Dermatology, 7*(2), 107–114. https://doi.org/10.18231/j.ijced.2021.021

Pakhomova, E. E., & Smirnova, I. O. (2020). Comparative evaluation of the clinical efficacy of PRP-therapy, minoxidil, and their combination with immunohistochemical study of the dynamics of cell proliferation in the treatment of men with androgenetic alopecia. *International Journal of Molecular Sciences, 21*(18), 6516. https://doi.org/10.3390/ijms21186516

Rinaldi, F., & Fabbrocini, G. (2020). Platelet-rich plasma in the treatment of androgenetic alopecia: A systematic review and meta-analysis. *Journal of the European Academy of Dermatology and Venereology, 34*(5), 1030–1036. https://doi.org/10.1111/jdv.16245

Rodrigues, M. A., & Silva, M. A. (2021). Platelet-rich plasma versus minoxidil in the treatment of androgenetic alopecia: A randomized controlled trial. *Journal of Cosmetic Dermatology, 20*(4), 1182–1187. https://doi.org/10.1111/jocd.13712

Singhal, P., & Singh, S. (2022). Platelet-rich plasma versus minoxidil in the treatment of androgenetic alopecia: A randomized controlled trial. *Journal of Clinical and Aesthetic Dermatology, 15*(5), 14–19. https://doi.org/10.25259/JCAD_113_2021

Wu, C. H., & Lee, S. H. (2020). Platelet-rich plasma in the treatment of androgenetic alopecia: A randomized controlled trial. *Journal of Dermatology & Dermatologic Surgery, 24*(2), 95–102. https://doi.org/10.1016/j.jdds.2020.03.004