A PROSPECTIVE COMPARATIVE STUDY OF PLATELET-RICH PLASMA VERSUS EXOSOME THERAPY IN NON –SCARRING ALOPECIA

Deboshree Goswami[1], Tasnuva Imran[2], Lina Malek[3], Monira Haque Jisa[4], Rahnuma Raihan Shuchi[5], Farha Rashid[6], Tasmery Khan Joyti[7]
[1]Aesthetic dermatologist, Dr. Lina's Skin & Aesthetic, Bangladesh
[2]Consultant dermatologist, Dr. Lina's Skin & Aesthetics, Bangladesh
[3]Consultant dermatologist, Dr. Lina's Skin & Aesthetics, Bangladesh
[4]Specialist in Advanced Aesthetic, Bangladesh
[5]Founder & Aesthetic Consultant, Drs Derma & Aesthetics, Bangladesh
[6]Consultant dermatologist, barak prp medical centre, Bangladesh
[7]Consultant dermatologist, serene skin, Bangladesh

Abstract

Background: Platelet-rich plasma (PRP) and exosome therapy are regenerative treatments for androgenetic alopecia. PRP uses autologous growth factors, while exosomes deliver bioactive molecules for potentially faster hair regrowth.

Objective: To compare efficacy, safety, and patient satisfaction of PRP versus exosome therapy in alopecia.

Methods: A Prospective observational study with 140 observations (70 PRP, 70 exosome) from adults with non-scarring alopecia (74.3% androgenetic). Participants received either PRP therapy, administered via both intradermal injection and microneedling, or exosome therapy, which was delivered exclusively through microneedling at sessions 1, 3, and 6 months. Outcomes were assessed by hair density, shedding, new hair growth, side effects, patient satisfaction level (0–10 scale). Data was analyzed with chi-square and t-tests.

Results: Exosome therapy showed superior tolerability (pain: 1.4% vs 98.6% in PRP, $p<0.001$). Moderate-to-significant improvement in hair density was higher with exosomes (61.4% vs 35.7%, $p=0.004$) and shedding reduction (57.1% vs 38.6%, $p=0.042$). New hair growth (71.4% vs 54.3%) and visible improvement within 1–3 months (45.7% vs 21.4%, $p=0.003$) favored exosomes. Satisfaction was higher (5.7 ± 1.7 vs 4.5 ± 1.8, $p<0.001$).

Conclusion: Exosome therapy demonstrated better tolerability, faster results, greater efficacy, and higher satisfaction than PRP for alopecia. Randomized trials are needed.

Keywords: androgenetic alopecia, platelet-rich plasma, PRP, exosome therapy, exosomes, hair loss, hair density, hair regrowth, regenerative medicine, alopecia treatment

ПРОСПЕКТИВНОЕ СРАВНИТЕЛЬНОЕ ИССЛЕДОВАНИЕ БОГАТОЙ ТРОМБОЦИТАМИ ПЛАЗМЫ ПО СРАВНЕНИЮ С ТЕРАПИЕЙ ЭКЗОСОМАМИ ПРИ НЕРУБЦОВОЙ АЛОПЕЦИИ

Дебошри Госвами[1], Таснува Имран[2], Лина Малек[3], Монира Хаке Джиса[4], Рахнума Райхан Шучи[5], Фарха Рашид[6], Тасмери Хан Джойти[7]
[1]Эстетический дерматолог, Dr. Lina's Skin & Aesthetic, Бангладеш
[2]консультант-дерматолог, Dr. Lina's Skin & Aesthetics, Бангладеш
[3]консультант-дерматолог, Dr. Lina's Skin & Aesthetics, Бангладеш
[4]Специалист в области продвинутой эстетики, Бангладеш
[5]Основатель и консультант по эстетике, Drs Derma & Aesthetics, Бангладеш
[6]Консультант-дерматолог, медицинский центр Барак Прп, Бангладеш
[7]Консультант-дерматолог, спокойная кожа, Бангладеш

Аннотация

Введение: Обогащенная тромбоцитами плазма (PRP) и экзосомальная терапия являются регенеративными методами лечения андрогенной алопеции. PRP использует аутологичные факторы роста, а экзосомы доставляют биоактивные молекулы для потенциально более быстрого возобновления роста волос.

Цель: сравнить эффективность, безопасность и удовлетворенность пациентов PRP и экзосомальной терапией при алопеции.

Методы: Проспективное обсервационное исследование с 140 наблюдениями (70 PRP, 70 экзосомами) у взрослых с нерубцовой алопецией (74,3% андрогенетической). Участники получали либо PRP-терапию, вводимую как посредством внутрикожных инъекций, так и микронидлинга, либо экзосомальную терапию, которая проводилась исключительно посредством микронидлинга на сеансах через 1, 3 и 6 месяцев. Результаты оценивались по густоте волос, их выпадению, росту новых волос, побочным эффектам, уровню удовлетворенности пациентов (шкала от 0 до 10). Данные были проанализированы с помощью хи-квадрата и t-критерия.

Результаты: Терапия экзосомами показала превосходную переносимость (боль: 1,4% против 98,6% в PRP, $p<0,001$). Умеренное или значительное улучшение густоты волос было выше при использовании экзосом (61,4% против 35,7%, $p=0,004$) и уменьшении выпадения (57,1% против 38,6%, $p=0,042$). Рост новых волос (71,4% против 54,3%) и видимое улучшение в течение 1–3 месяцев (45,7% против 21,4%, $p=0,003$) способствовали использованию экзосом. Удовлетворенность была выше ($5,7 \pm 1,7$ против $4,5 \pm 1,8$, $p<0,001$).

Заключение: Терапия экзосомами продемонстрировала лучшую переносимость, более быстрые результаты, большую эффективность и более высокую удовлетворенность, чем PRP при алопеции. Необходимы рандомизированные исследования.

Ключевые слова: андрогенетическая алопеция, богатая тромбоцитами плазма, PRP, экзосомальная терапия, экзосомы, выпадение волос, густота волос, возобновление роста волос, регенеративная медицина, лечение алопеции.

 Correspondence: Dr. Deboshree Goswami, Aesthetic dermatologist, Dr. Lina's Skin & Aesthetic, Bangladesh, Email: kartick_shaha@gmail.com

1. Introduction and Background

Platelet-rich plasma (PRP) and exosome therapy are regenerative options for androgenetic alopecia (AGA) that differ in preparation, mechanism, and clinical outcomes.[2] PRP, derived from autologous blood, delivers growth factors to stimulate follicles and usually needs 3–6 sessions for gradual gains in hair density.[2] Exosome therapy employs cell-derived extracellular vesicles carrying bioactive molecules and may produce faster results, sometimes after one session.[3] Androgenetic alopecia, the most prevalent type of hair loss, causes progressive follicle miniaturization through genetic and dihydrotestosterone (DHT)-driven mechanisms, resulting in substantial psychological burden.[4] Standard therapies include oral finasteride and topical minoxidil (the only FDA-approved option for female pattern hair loss). Both demand continuous application, often trigger scalp irritation, and lead to relapse after stopping.[5] These shortcomings have increased interest in regenerative approaches. PRP, used

clinically for over a decade, promotes angiogenesis, activates the Wnt/β-catenin pathway, and extends the anagen phase.[6] Systematic reviews indicate PRP is generally safe and increases hair density, though results vary with severity and frequently diminish after 12–16 months without maintenance sessions; preparation protocols also lack standardization.[7] Exosome therapy delivers growth factors, cytokines, and microRNAs via nanoscale vesicles (30–150 nm) directly to follicle cells.[8] Preclinical and early clinical data show promotion of hair growth by activating regenerative pathways, lowering oxidative stress, and controlling inflammation. As a cell-free option, exosomes potentially provide more uniform biological effects than variable autologous PRP.[9] Head-to-head comparisons remain scarce. A 2024 case series found exosome therapy produced visible gains after fewer sessions than PRP. 9 A 2025 systematic review highlighted exosomes as offering the strongest potential for regrowth and safety. [10]

Objectives:
To assess improvement in hair density and reduction in hair shedding with PRP and exosome therapy.

To evaluate side effect profiles and patient satisfaction.

To compare new hair growth and time to visible improvement between the two modalities.

Methods:
Study Design: Prospective Observational Comparative Study

Study Setting and Duration: Conducted at Dr. Lina's Skin and Aesthetics Center from January to December 2025.

Study Population: Patients with alopecia (primarily androgenetic alopecia and other non-scarring alopecia's) that underwent PRP or exosome therapy.

Inclusion Criteria:
Adults (⩾18 years) with clinically diagnosed alopecia.

Willing to undergo PRP or exosome therapy and attend follow-up visits.

Exclusion Criteria:

Scarring alopecia.

Active scalp infection orinflammation.

Pregnancy or breastfeeding.

Contraindications to PRP (e.g., blood disorders, active cancer) or exosome therapy.

Sampling and Sample Size: A total of 140 observations were recorded from consecutive eligible patients. Observations were equally divided (70 each) between PRP and exosome groups.

Treatment Protocol:
PRP therapy: Prepared from autologous blood using standard double-spin centrifugation; injected intradermally and by microneedling into the scalp.

Exosome therapy: Commercially prepared or lab-isolated exosomes (Exosome derived from human umbilical cord blood mesenchymal stem cells, particle count-49.2 billion, exosome particle size-120nm) administered via microneedling. Sessions were scheduled as per standard protocols: assessments at 4 weeks (after 1 session), 12 weeks (after 3 sessions), and 24 weeks (after 6 sessions).

Data Collection: Data were collected using a structured proforma at each follow-up. Variables included socio-demographic characteristics, baseline clinical features (duration of hair loss, family history, alopecia type, baseline hair density and shedding scores on 0-10 scale), scalp symptoms, previous treatments, treatment type, number of sessions, improvement in hair density and shedding (categorized as none, mild, moderate, significant), new hair growth, time to visible improvement, side effects, satisfaction with treatment outcome (0-10 scale), overall satisfaction, recommendation to others, and continuation of therapy.

Statistical Analysis: Data were summarized using descriptive statistics (mean ± SD for continuous variables; frequencies and percentages for categorical variables). Between-group comparisons used chi-square test or Fisher's exact test for categorical variables and independent t-test for continuous variables (e.g., satisfaction score). Due to imbalance in follow-up visits, stratified analyses were performed. A p-value <0.05 was considered statistically significant. Analyses were conducted using SPSS v27. Multivariable adjustment for follow-up duration was considered where appropriate.

Ethical Considerations: The study was conducted in accordance with the Declaration of Helsinki. Informed consent was obtained from all participants.

Results

Socio-demographic and Baseline Characteristics: A total of 140 observations (70 PRP and 70 exosome) from patients with alopecia were analysed. The mean age was 32.7 ± 11.5 years, with 52.9% males. Students comprised 38.6% of participants, and androgenetic alopecia was the main diagnosis (74.3%). The two treatment groups were comparable in age, gender,family history, alopecia type, disease duration, and baseline hair density/shedding scores (all p > 0.05; Table 1).

Table 1: Socio-demographic and baseline characteristics of the study participants by treatment group (n=140)

Variable	Category	PRP (n=70) n (%) or Mean ± SD	Exosome (n=70) n (%) or Mean ± SD	p-value
Age (years)	—	32.5 ± 11.2	32.9 ± 11.8	0.82
Gender	Male	37 (52.9)	37 (52.9)	1.00
	Female	33 (47.1)	33 (47.1)	—
Family history of alopecia	Yes	38 (54.3)	37 (52.9)	0.87
	No	32 (45.7)	33 (47.1)	—
Alopecia type	Androgenetic alopecia	52 (74.3)	52 (74.3)	1.00
	Other (nutritional deficiency, thyroid-related, etc.)	18 (25.7)	18 (25.7)	—
Duration of hair loss	>3 years	28 (40.0)	29 (41.4)	0.91
	1–3 years	25 (35.7)	24 (34.3)	—
	6–12 months	12 (17.1)	12 (17.1)	—
	<6 months	5 (7.1)	5 (7.1)	—

Baseline hair density (0–10 scale)	—	6.4 ± 1.1	6.3 ± 1.2	0.65
Baseline hair shedding (0–10 scale)	—	3.6 ± 1.3	3.5 ± 1.2	0.71

p-values were calculated using independent t-test for continuous variables (age, baseline scores) and chi-square or Fisher's exact test for categorical variables.

Clinical effectiveness: Table 2 describe both PRP and exosome therapies demonstrated moderate to significant effectiveness in alopecia treatment. Exosome therapy showed superior outcomes, with greater improvement in hair density (61.4% vs 35.7%), reduction in shedding (57.1% vs 38.6%), faster visible results, and higher patient satisfaction compared to PRP.

Table 2: Clinical effectiveness outcomes by treatment group

Outcome	PRP (n=70) n (%) or Mean ± SD	Exosome (n=70) n (%) or Mean ± SD	p-value
Improvement in hair density – Moderate/ Significant	25 (35.7)	43 (61.4)	0.004
Reduction in hair shedding – Moderate/ Significant	27 (38.6)	40 (57.1)	0.042
New hair growth – Yes	38 (54.3)	50 (71.4)	0.054
Time to visible improvement – 1-3 months	15 (21.4)	32 (45.7)	0.003
Satisfaction score (0–10)	4.5 ± 1.8	5.7 ± 1.7	<0.001

p-values calculated using chi-square test for categorical variables and independent t-test for satisfaction score.

Side Effects Profile: Injection-site pain was the most frequent adverse event (50.0% overall) and occurred almost exclusively in the PRP group (98.6% vs 1.4% in exosome group). No side effects were reported in 98.6% of exosome observations versus 0% in PRP. The difference in side-effect profile between groups was highly statistically significant (p<0.001) (Table 3). Exosome therapy demonstrated markedly superior tolerability.

Table 3: Side effects profile by treatment group

Side Effect	PRP (n=70) n (%)	Exosome (n=70) n (%)	Total (n=140) n (%)	p-value
Pain	69 (98.6)	1 (1.4)	70 (50.0)	<0.001
None	0 (0.0)	69 (98.6)	69 (49.3)	<0.001
Headache	1 (1.4)	0 (0.0)	1 (0.7)	—

Improvement in Hair Density and Hair Shedding: Exosome therapy produced significantly better improvement in both hair density and hair shedding compared with PRP. Moderate-

to-significant improvement in hair density occurred in 61.4% of exosome observations versus 35.7% in PRP (overall between-group p=0.004). Moderate-to-significant reduction in hair shedding was observed in 57.1% of exosome observations versus 38.6% in PRP (p=0.042) (Table 4).

Table 4: Improvement in hair density and reduction in hair shedding by treatment group

A. Improvement in Hair Density

Outcome	PRP (n=70) n (%)	Exosome (n=70) n (%)	Total (n=140) n (%)	p-value
None	25 (35.7)	16 (22.9)	41 (29.3)	0.004
Mild	20 (28.6)	11 (15.7)	31 (22.1)	
Moderate	24 (34.3)	39 (55.7)	63 (45.0)	
Significant	1 (1.4)	4 (5.7)	5 (3.6)	

B. Reduction in Hair Shedding

Outcome	PRP (n=70) n (%)	Exosome (n=70) n (%)	Total (n=140) n (%)	p-value
None	18 (25.7)	8 (11.4)	26 (18.6)	0.042
Mild	25 (35.7)	22 (31.4)	47 (33.6)	
Moderate	25 (35.7)	39 (55.7)	64 (45.7)	
Significant	2 (2.9)	1 (1.4)	3 (2.1)	

Patient Satisfaction and Other Outcomes: Mean satisfaction score (0-10 scale) was significantly higher in the exosome group (5.7 ± 1.7) than in the PRP group (4.5 ± 1.8) (p<0.001). New hair growth was reported in 71.4% of exosome observations versus 54.3% in PRP (p=0.054). Visible improvement within 1–3 months occurred in 45.7% of the exosome group versus 21.4% in the PRP group (p=0.003) (Table 5).

Table 5: New hair growth, time to visible improvement, and satisfaction by treatment group

Outcome	PRP (n=70)	Exosome (n=70)	Total (n=140)	p-value
New hair growth – Yes, n (%)	38 (54.3)	50 (71.4)	88 (62.9)	0.054
Time to visible improvement – 1-3 months, n (%)	15 (21.4)	32 (45.7)	47 (33.6)	0.003
Mean satisfaction with outcome (0-10)	4.5 ± 1.8	5.7 ± 1.7	5.1 ± 1.9	<0.001

Figure A Figure B

Figure A, B: Trichoscopic findings in a patient treated with exosome therapy

Figure A baseline image demonstrating reduced hair density, increased hair shaft diameter variability (anisotrichosis), and higher proportion of vellus hairs, consistent with androgenetic alopecia.Figure B post-treatment image at 24 weeks following exosome therapy showing increased terminal hair density, improved hair shaft thickness and uniformty and scalp visibility. A relative decrease in vellus hair proportion and follicular miniaturization is also observed, indicating enhanced follicular activity and regeneration. These trichoscopic improvements appeared earlier and more pronounced in the exosome group compared to prp-treated patients.

In summary, both PRP and exosome therapies demonstrated moderate efficacy in improving hair density and reducing shedding. However, exosome therapy was associated with statistically superior tolerability (virtually no pain) and better clinical outcomes, including greater improvement in hair density ($p=0.004$), reduction in shedding ($p=0.042$), faster visible results, higher new hair growth rates, and significantly higher patient satisfaction ($p<0.001$).

Discussion: This prospective observational study supplies real-world evidence comparing PRP and exosome therapies in alopecia patients. Moderate gains in hair density and reductions in shedding occurred in nearly half the observations, matching patterns reported in regenerative treatment literature.[11] New hair growth appeared in 62.9% of cases, consistent with activation of growth-factor and Wnt/β-catenin signalling.The side-effect profile stood out: injection-site pain occurred almost exclusively with PRP (50% overall), whereas nearly half of exosome cases reported no adverse events. This aligns with evidence favouring exosomes for improved tolerability and reduced discomfort.[12] Patient satisfaction averaged 5.1/10 on a 0–10 scale, with roughly equal neutral and satisfied responses. Visible improvement often took over six months, underscoring the gradual nature of follicular regeneration and the value of realistic patient counselling.Our findings echo broader reviews showing PRP delivers steady but slow progress, while exosomes may enable quicker or more efficient outcomes with fewer treatments in selected studies.[13] However, significant improvement remained uncommon, likely influenced by long disease duration in over half the cohort and variable baseline severity. Although exosome therapy showed numerically better efficacy outcomes, the exosome group

had more late follow-up observations, which may partly explain these differences as hair improvement is time- and session-dependent.

Conclusion: In this prospective observational study, both PRP and exosome therapies demonstrated moderate efficacy in improving hair density and reducing hair shedding in patients with alopecia. Exosome therapy was associated with significantly better tolerability and fewer side effects, particularly pain. These findings support the role of regenerative therapies as viable options for alopecia management, with exosome therapy potentially offering advantages in patient comfort. Larger, randomized, controlled trials with objective measurements and longer follow-up are recommended to establish comparative superiority, optimal protocols, and long-term durability of results.

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Conflicts of Interest: None

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