

# A Pilot Study of Intra-Scalp Platelet-Rich Plasma (PRP) Injections for Hair loss (alopecia) – A cost-effective adaptation in Nigerian patients

OTROFANOWEI E, FMCP, AYANLOWO OO, MSc, FWACP, AKINKUGBE AO, FWACP

Department of Medicine, College of Medicine, University of Lagos/Lagos University Teaching Hospital, Lagos, Nigeria

**Corresponding Author:** Erere Otrofanowei

**Email:** ererey@yahoo.co.uk. **Phone:** +234 8033263378

## ABSTRACT

**Background:** Intra scalp injections of platelet-rich plasma (PRP) have been used alone or as adjuvant therapy for hair restoration. The use of activated PRP with commercially available kits has limited the uptake of this modality in Nigerian patients due to cost and low availability. A cheaper adaptation of the documented methods of extracting PRP is utilised in this cohort of Nigerian patients with alopecia.

**Aim:** To document the effect of intra-scalp autologous PRP injections extracted using plain bottles in a cohort of Nigerian patients with non-scarring alopecia.

**Methods:** Three sessions of monthly injections of autologous PRP were administered to 8 patients (F: M = 7:1) with  $\geq 2$  years of hair loss. A Severity of Alopecia Tool (SALT) score to assess severity; trichoscopy and a hair pull test were done. Ten millimetres of each patients' blood was collected into plain and Potassium ( $K^{2}$ ) EDTA bottles; centrifuged at 4000 rpm for 10 minutes for the first spin; extract re-spun for 5 minutes and injected into the anaesthetised alopecic scalp with a 29-G needle.

**Results:** Seven patients had obvious hair regrowth and negative hair pull test at review (1 month after three sessions). Trichoscopy demonstrated an increase in hair density and diameter in 6 patients. One patient had no demonstrable change.

**Conclusions:** Hair regrowth was observed in this pilot of patients following PRP injections using accessible and affordable vacutainer tubes. Standardisation of more affordable methods of obtaining platelet-rich growth factors is required.

**Keywords:** Platelet-rich plasma, PRP, Alopecia, Hair loss

## Une Étude Pilote sur les Injections de Plasma Riche en Plaquettes (PRP) dans Le Cuir Chevelu Pour La Perte de Cheveux (Alopécie) - une Adaptation Rentable Chez Les Patients Nigériens

### ABSTRAIT

**Contexte:** Les injections intra cuir chevelu de plasma riche en plaquettes (PRP) ont été utilisées seules ou en traitement adjuvant pour la restauration capillaire. L'utilisation de PRP activé avec des kits disponibles dans le commerce a limité l'adoption de cette modalité chez les patients nigériens en raison du coût et de la faible disponibilité. Une adaptation moins chère des méthodes documentées d'extraction de PRP est utilisée dans cette cohorte de patients nigériens atteints d'alopécie.

**Objectif:** Documenter l'effet des injections intra-cuir chevelues de PRP autologue extrait à l'aide de flacons simples dans une cohorte de patients nigériens atteints d'alopécie non cicatricielle.

**Méthodes:** Trois séances d'injections mensuelles de PRP autologue ont été administrées à 8 patients (F : M = 7 : 1) avec  $\geq 2$  ans de perte de cheveux. Un score de l'outil de gravité de l'alopécie (SALT) pour évaluer la gravité ; une trichoscopie et un test d'arrachement des cheveux ont été effectués. Dix millimètres de sang de chaque patient ont été recueillis dans des bouteilles simples et de potassium ( $K^{2}$ ) EDTA; centrifugé à 4000 rpm pendant 10 minutes pour le premier tour ; extrait centrifugé pendant 5 minutes et injecté dans le cuir chevelu alopecique anesthésié avec une aiguille 29-G.



**Résultats:** Sept patients avaient une repousse évidente des cheveux et un test d'arrachement des cheveux négatif lors de l'examen (1 mois après trois séances). La trichoscopie a démontré une augmentation de la densité et du diamètre des cheveux chez 6 patients. Un patient n'a eu aucun changement démontrable.

**Conclusions:** La repousse des cheveux a été observée dans ce projet pilote de patients suite à des injections de PRP à l'aide de tubes Vacutainer accessibles et abordables. La standardisation de méthodes plus abordables d'obtention de facteurs de croissance riches en plaquettes est nécessaire.

**Mots clés:** Plasma riche en plaquettes, PRP, Alopécie, Chute de cheveux

## Introduction

Hair loss is a relatively common and distressing condition for many people globally, and management of this condition can be exorbitant and frustrating. Whether it is a clear bald patch on the scalp or a gradual but definite reduction in hair density, most sufferers try to curb or halt the progress altogether. Sometimes, self-prescribed solutions, including adding hair extensions, using wigs/toupees, or dyeing the hairs to camouflage or distract from the hair loss, tend to worsen the alopecia.<sup>1</sup> The overall prevalence of hair loss in the Nigerian populace is unknown, but hospital frequencies range from 6.6% to 46.7% in Southwest Nigeria.<sup>2,3</sup> Physicians have attempted hair restoration with topical and systemic corticosteroids and topical minoxidil, among other measures that form the bedrock of management. Intra-scalp injections with Platelet-rich plasma (PRP) have been increasingly used as adjuvant treatment for non-scarring hair loss with varying degrees of success.<sup>4-6</sup> The mechanism of action is not completely understood but seems to be based on the elaboration of many growth factors which are thought to stimulate quiescent hair bulb/ follicular units in the dermal papilla.<sup>5,6</sup> The PRP is an autologous concentrate of platelets obtained by spinning a patient's whole blood in a centrifuge and extracting it in a small volume of plasma. This is subsequently injected into the site mapped out to be treated at different specified periods.<sup>6,7</sup> There is currently no accepted, validated, or standardised method of extracting and utilising PRP, hence results differ. Many studies have used commercially prepared activation kits, while a few others have demonstrated some success with the use of plain PRP that is not exogenously activated with the addition of Calcium chloride or thrombin.<sup>5,6</sup> The latter is based on the theory that different growth factors will be induced on demand for their biological effect when the PRP

is injected at indicated sites.<sup>6,8</sup> The PRP kits are not easily available in Nigeria, and the high cost may prevent widespread use in the country. This study aimed at exploring the efficacy of intra-scalp injections of autologous PRP using plain bottles (thus non-activated) in patients with non-scarring hair loss (alopecia).

## Aim

To determine the effect of intra-scalp autologous PRP injections extracted using plain bottles in a cohort of Nigerian patients with alopecia.

## Method

This study was an interventional pilot study carried out on consecutive consenting patients with non-scarring alopecia at the Dermatology Clinic of the Lagos University Teaching Hospital. The diagnosis of alopecia was made by the authors, who are consultant dermatologists. Indications were patients who had been managed unsatisfactorily for hair loss in the last two years with topical and intralesional corticosteroids and other measures in referring hospitals with little improvements, and one of them had worsening hair loss. Medications were stopped two weeks prior to commencing the study. Trichoscopy and a hair pull test were carried out on all patients for further clinical assessments prior to the procedure. Baseline full blood counts were assessed for normal platelet counts. Additional tests to screen for HIV I & II, Hepatitis B and C were carried out. All participants gave informed written consent.

A numbing cream- Tronothane® was applied to the scalp of all patients about 30 minutes prior to the intra-scalp injections. In a two-step process, ten millilitres (ml) of patients' whole blood was collected into plain and EDTA bottles each; centrifuged using Axion -UK Centrifuge® at 4000rpm for 10 minutes for the first spin; the

supernatant containing both platelet-poor plasma (PPP) and platelet-rich plasma (PRP) was extracted using a syringe into a plain bottle and re-spun for 5 minutes at the same spin. The platelet-rich plasma at the bottom one-third of the tube was extracted suspended in 2 mls of plasma. Each patient thus had two plain bottles of 3mls and 1 ml of PRP (one each from the initial EDTA and plain bottles containing whole blood), respectively. The PRP was injected into an anaesthetised alopecic scalp with a 29G needle within 1cm perimeter margins of the affected areas. This process was done monthly for three months. Clinical photographs were taken, and a pain score of the procedure was obtained after each session.

## Results

There were 8 (F: M = 7: 1) patients aged between 23 and 59 years old with a duration of hair loss ranging from 2 years to 36 years. Two (25%) were undergraduate students, and the others (75%) were working class. Two patients (25%) had alopecia areata with the ophiasis pattern; two patients (25%) had female pattern hair loss (FPHL), and two (25%) had chemical plus traction alopecia, while 1 (12.5%) had only traction alopecia. (Fig 1). One patient had features of both scarring and non-scarring alopecia. The only male in the cohort had male pattern baldness. Three (37.5%) of the females had used minoxidil, and two study subjects, 1 with FPHL and 1 with traction alopecia, (25%) had done a hair transplant prior to enlisting in the study.

A hair-pull test was positive in only one (12.5%) at baseline and negative in seven (87.5%) at the end of three sessions of monthly injections. Seven patients had subtle but obvious hair regrowth to varying degrees (Fig 2). One patient could not carry out the third monthly session because the pain was unbearable. Trichoscopy demonstrated an increase in hair density and diameter in six patients. (Fig 3c) One patient had no demonstrable change. All patients experienced pain, with an average score of 8/10 calculated using the Likert scale. There was no significant difference in the pain score with or without topical anaesthesia applied. However, the pain experienced was more with the PRP extracted from the whole blood collected in EDTA bottles than plain bottles. There were no other side effects

recorded. A smaller volume of PRP was obtained from the plain bottle/plain bottle 2-step procedure than from the EDTA/plain bottle step. The PRP needed to be used up quicker with the plain bottles.

## Discussion

Hair regrowth in the management of alopecia is both objective and subjective - with the subjective component being very important to the patient's quality of life. This pilot study with a simple, practical, and affordable PRP extraction technique demonstrated improvement in hair loss appreciable in almost all the patients involved. Alopecia, irrespective of the cause, is a condition with significant morbidity in both sexes and affects all races. There were more females than males in this cohort. The significant female preponderance may be because females are traditionally more concerned with their appearance, and the hair is considered the crowning glory of a woman in the Christian faith.<sup>9</sup> Though this pilot was non-discriminatory in its patient selection since consecutive patients were approached to participate, it buttresses the fact that females will present more to the clinic for hair restoration therapy.<sup>3</sup> The patients were mostly young and less than 45 years (75%), with only two (25%) being middle-aged. Young adults tend to socialise more; hence they are more concerned about their looks and the attendant stigma that could be associated with the frequent use of wigs or other hair camouflage measures.<sup>1</sup> They are also more adventurous and more willing to try novel therapeutic innovations like platelet-rich plasma therapy. This may explain why only two patients in this cohort were middle-aged.

Seventy-five (75%) of the patients had a duration of hair loss between 2 and 12 years, with only one person having hair loss for more than 20 or 30 years. They all tried out different oral and topical measures with little improvement, as in most patients with alopecia. The two middle-aged ladies had tried hair transplants unsuccessfully. Many studies have shown that management of this condition is often unsatisfactory and chronic.<sup>5-7</sup> The almost equal distribution of the types of non-scarring alopecia is not by design, and the sample size is too small to make any further comment on this.

Improvement in hair density and hair diameter with vellus hairs seen in previous bald patches was demonstrated in 87.5% of the patients who had unactivated PRP injections with the simple method described using plain bottles. There was less PRP to utilise using the plain bottle without anticoagulant for whole blood collection, but this was a comparably less painful procedure than that collected with the K2 EDTA bottle. In this cohort of patients, different treatment modalities had been tried with little or no evidence of hair regrowth. None had undergone PRP prior to this pilot study. Though the patients did not pay for the sessions, the disposable equipment for each session cost less than N20,000.00 (\$50.00), which is far less than a minimum of \$200 of the commercially available PRP kits. However, it must be noted that the cost of these kits is reducing with more companies now producing them for Latin America, Asia, and the Middle East.<sup>10</sup> A study in Malaysia reported a similar cost-effective PRP extraction method for clinical use (particularly soft tissue injuries) at an affordable cost of \$7.02 per session for the consumables only. This was considerably cheaper when compared with a commercially prepared kit which costs a minimum of \$175.00 in the same environment.<sup>11</sup> A few other studies with slightly similar protocols have demonstrated efficacy of the cost-effective technique using simple consumables which may be found in a standard laboratory.<sup>12,13</sup>

This pilot study shows a promising result with this intervention in our environment, and it is hoped that with a larger study population, categorical statements may be made concerning the methodology and outcomes.

### **Limitation**

This study is notably a pilot one, and proper patient selection was not done for the type of alopecia being treated. A head-to-head quantitative comparison of the platelet concentration in each of the PRP extracted from the EDTA and the plain bottles would have provided more objective evidence as to the validity of this adaptation technique. The pain experienced by all the patients was a limitation that prevented at least one patient from completing the sessions.

### **Conclusion**

Hair regrowth is observed in this pilot of patients with alopecia following PRP injections using accessible and affordable vacutainer tubes. The patients were happy with the hair regrowth, and all felt better subjectively despite the pain of the procedure. Perhaps more sessions need to be done for sustained effects, which is what is planned for the actual study. Sometimes, simpler solutions need to be explored for those who cannot afford the kits. Standardization of more affordable methods of obtaining platelet-rich growth factors is required. The patients generally accepted the treatment and were encouraged by the slow but obvious improvements seen. Whilst eager to continue this therapy, they all expressed concern for the procedure's pain, hoping there would be solutions to this. The authors suggest other pain reduction methods for the procedure, such as intra-scalp local anaesthesia and/or applying a vibration device to the scalp during the procedure to distract the patient.

**The authors declare no conflicts of interest and have no financial disclosures**

### **REFERENCES**

1. Saed S, Ibrahim O, Bergfeld WF. Hair camouflage: a comprehensive review. *International journal of women's dermatology*. 2016 Dec 1;2(4):122-7
2. Madubuko CR, Okwara BU. A 5-year retrospective study on alopecia in a tertiary hospital in Southern Nigeria. *Research Journal of Health Sciences*. 2020 Oct 9;8(3):175-82.
3. Sani H, Ogunbiyi O A, George AO, Okoro O E. Prevalence and pattern of alopecia in secondary and tertiary institutions in Ibadan. *Sub-Saharan Afr. J Med [serial online]* 2016 [cited 2022 Jan 23]; 3:148-52. Available from: <https://www.ssajm.org/text.asp?2016/3/3/148/19085>
4. Cole JP, Cole MA, Insalaco C, Cervelli V, Gentile P. Alopecia and platelet-derived therapies. *Stem cell investigation*. 2017;4:88
5. Garg S, Manchanda S. Platelet-rich plasma—an 'Elixir' for treatment of alopecia: personal experience on 117 patients with review of

literature. Stem cell investigation. 2017;4:64

6. Dhurat R, Sukesh MS. Principles and methods of preparation of platelet-rich plasma: a review and author's perspective. *Journal of cutaneous and aesthetic surgery*. 2014 Oct;7(4):189.
7. Schiavone G, Raskovic D, Greco J, Abeni D. Platelet-rich plasma for androgenetic alopecia: a pilot study. *Dermatologic Surgery*. 2014 Sep 1;40(9):1010-9.
8. Scherer SS, Tobalem M, Vigato E, Heit Y, Modarressi A, Hinz B, Pittet B, Pietramaggiore G. Nonactivated versus thrombin-activated platelets on wound healing and fibroblast-to-myofibroblast differentiation in vivo and in vitro. *Plastic and reconstructive surgery*. 2012 Jan 1;129(1):46e-54e.
9. *King James Bible*, 1769/2008: 1 Corinthians 11:15
10. Ribeiro AP, Oliveira BG. Production cost of autologous platelet rich plasma gel. *Revista Latino-Americana de Enfermagem*. 2019 Dec 5;27.
11. Hamid MS. Cost effectiveness of a platelet-rich plasma preparation technique for clinical use. *Wounds*. 2018 Jul 1;30(7):186-90.
12. Machado ES, Soares FP, Yamaguchi RS, Felipone WK, Meves R, Souza TA, Topolniak R, Caldas JP, Abreu EV, Neto LS, Pinchemel PV. A Simple Double-Spin Closed Method for Preparing Platelet-Rich Plasma. *Cureus*. 2022 Jan 3;14(1).
13. Khatu SS, More YE, Gokhale NR, Chavhan DC, Bendsure N. Platelet-rich plasma in androgenic alopecia: myth or an effective tool. *Journal of cutaneous and aesthetic surgery*. 2014 Apr;7(2):107.

**TABLE 1.** Socio-Demographic Characteristics of Participants

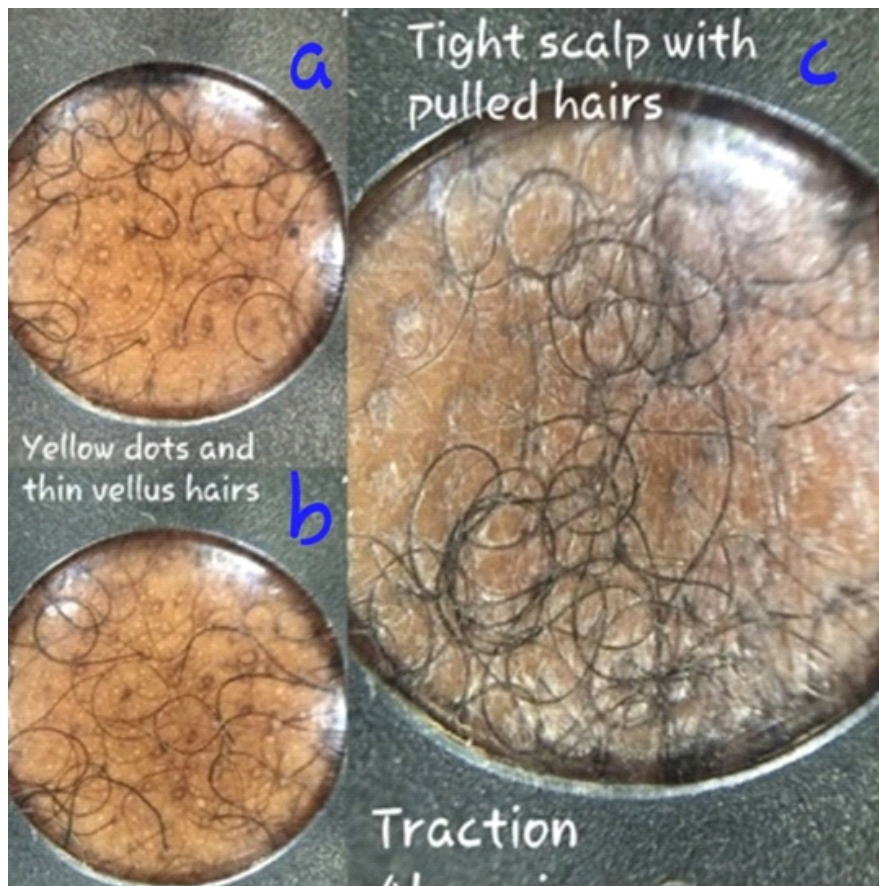
<b>Variable</b>	<b>Frequency (n = 8)</b>	<b>%</b>
<b>Age group (years)</b>		
< 25	1	12.5
25 – 34	3	37.5
35 – 44	2	25
45 – 54	0	0
55 – 64	2	25
<b>Duration of hair loss (years)</b>		
< 1	0	0
1 – 4	2	25
5 – 9	2	25
10-19	2	25
20-29	1	12.5
30-39	1	12.5
<b>Family history of hair loss</b>		
Yes	1	12.5
No	7	87.5



**Figure 1:** Traction alopecia with fringe sign and patch hair loss at the frontal margins (a, b, c) before and improvement (d, e, f) after PRP sessions.



**Figure 2:** Alopecia areata (ophiasis pattern) with no hairs at the parietal margins before PRP (a, b, c) and fine vellus hairs of regrowth (d, e, f) after 3 PRP sessions



**Figure 3:** Trichoscopy of traction alopecia (of the patient in Figure 1) with thin hairs and empty but intact follicles in 3a and 3b at baseline; 3c shows improved hair density and diameter but with perfollicular scales after PRP sessions