Effects of Platelet Rich Plasma in Treatment of Androgenetic Alopecia (AGA): An Interventional Study

Dr. Chetan Sharma[1], Dr. Rajkumar Kothiwala[2§], Dr. Ashok Meherda[3], Dr. Ramya BG[4], Dr. Chandresh Yadav[5], Dr. Rakesh Yadav[6], Dr. Deepak Bohara[7]

[1,4,5,6,7]Junior Resident, Department of Skin and VD, JLN Medical college, Ajmer (Rajasthan) India.
[2]Associate Professor, Department of Skin and VD, JLN Medical college, Ajmer (Rajasthan) India
[3]Senior Professor, Department of Skin and VD, JLN Medical college, Ajmer (Rajasthan) India

Abstract— *Androgenetic alopecia (AGA) is a common condition having severe psychosocial implications. Numerous modalities of treatment are there but none is satisfactory both to the patient and the treating physician. This present study was carried out on 50 patients of AGA aged between 20 to 50 years to find out the effect of PRP with micro needling on AGA. These selected cases were treated by activation of the procedure site (scalp) by micro needling technique and application of platelet rich plasma on the activated site. A total of 6 such sittings were given to each patient at interval of 30 days each, over a total period of 6 months. Macro photographs were taken at baseline and after 6 months by 2 independent observers who rated those using of standardized seven-point rating scale of clinical change. In this study, 24% patients perceived stoppage of hair fall, 68% patients noticed reduction in hair fall, 6% of the patients perceived no change in hair fall and remaining 2% patients perceived increased hair fall after last visit with minimal or no side effects. So over all 92% patients had noticed some clinical improvement in their condition. So it was concluded that PRP with micro needling is an effective combination in treating AGA. This may be because micro needling has its own action and it would also help in promoting penetration of PRP but the level of evidence of this fact as available published data is low. This demands further studies to gain more evidence before it is used more extensively.*

Keyword: Androgenetic Alopecia(AGA), Platelet Rich Plasma (PRP), Micro Needling.

I. INTRODUCTION

Androgenetic alopecia (AGA) is a non scarring alopecia that affects both males and females.[1] It's prevalence increases with age and affects 50% of men and women by 50 years of age.[2] By the age of 20, over 90% of males demonstrate some degree of hair loss which is usually progressive and patterned.[3] In contrast, in females the alopecia presents as diffuse loss of hair largely affecting the frontal and vertex areas.

Androgenetic alopecia involves the action of androgens which are needed for regulation of hair growth in both sexes.[4] The hormone specifically involved is the Dihydrotestosterone (DHT) which leads to change in local metabolism leading to conversion of susceptible terminal hairs into vellus hairs.[1] Additionally, Transforming Growth Factor–Beta (TGF-B) an inhibitory factor secreted by hair follicles, micro-needling proliferation and cellular differentiation.

Treatment modalities proposed for promoting hair growth in AGA include topical Minoxidil, topical Amenexil, oral and topical 5-alpha reductase inhibitors (finasteride and dutasteride), Oral biotin, botulinum toxins injections, hair transplant surgery etc. Platelet rich plasma (PRP) is an autologous preparation of platelets in concentrated plasma[5] and is an exciting non surgical therapeutic option for hair growth and stimulation.[6]

Rachita durat et al[7] showed that micro needling is a safe and a promising tool in hair stimulation both for male and female Androgenetic alopecia. Micro needling work by stimulation of stem cells and by inducing activation of growth factors.

There is paucity of evidences in this field so this study was conducted to find out the effect of PRP with micro needling on AGA.

II. METHODOLOGY

This study was conducted in the Dept. of Dermatology at JLN Medical College, Ajmer (Rajasthan) from January 2016 to December 2016. For this study 50 patients of clinically diagnosed AGA aged between 20 to 50 years who presented with male patterned hair loss Grade III to VI and not taking any treatment for last 6 months, were selected after informed consent.

Patients, with alopecia other than androgenetic alopecia, history of bleeding disorders or on anti-coagulant medications (aspirin, warfarin, heparin), active infection at the local site, keloidal tendency , immunosuppresion diseased, any systemic illness/psychiatric illness and history of psoriasis or lichen planus (because of risk of Koebner phenomenon) were excluded from this study.

For making of Remi centrifuge machine is pre cooled at 20^{o} C for 10 minutes. After obtaining informed consent, 8.5 ml blood sample was aspirated using 18G needle and collected in ACD vacutainer tube. The first centrifugation or soft spin was carried out at 2500 rpm for 7 minutes at 20^{o} C and the separated buffy coat with PPP was collected with the help of 2 ml syringe in another plane vacutainer. This vacutainer underwent a second centrifugation, a faster hard spin at 3000 rpm for 6 minutes at 20^{o} C. The upper layer containing PPP was discarded and the lower layer of PRP was taken for platelet count. Platelet concentration was 4 -5 times more in yellow red colored concentrated PRP than the whole blood. Whole procedure is carried out under aseptic conditions.

Activation of the procedure site (scalp) by micro needling technique using a derma-roller with needle length 1- 1.5 mm. Application of extracted plasma on the activated site and massaging, allow it to percolate through the epidermis.

A total of 6 such sittings were given to each patient at interval of 30 days each, over a total period of 6 months. Patients will be instructed not to alter their hair style and not to use any hair dye during the study period. To document any possible clinical change in the scalp region and in the hairs macrophotographic protocol was used by assessing on 7 point rating scale.

This photographic protocol required patients to wet their hair by wiping their scalp with a sponge soaked with 5 ml of saline solution. No products were added to the patients' hair. Pictures were taken at the time of every procedure and at the end of the treatment. Pictures were always shot with the same digital camera, same lens, using as far as possible the same patient position (3 angles for the parietal/frontal scalp and 2 angles for the crown) and maintaining approximately the same head angle. Pictures were all taken by the same person even if in different light conditions.

The clinical change between the first assessment and the end of the follow up was rated by 2 independent assessors. Standardized global photography (visual analogue score) with the use of standardized seven-point rating scale (+3, +2, +1, 0,-1,-2,-3) greatly increased density to greatly dereased.[1] Statistical analysis is done by using *paired't'* test and *unpaired't'* test Patient's self-satisfaction also assessed.

III. RESULTS

Fifty men were enrolled in this study in which 78% patient had positive family history for AGA . The median age was 34.3 years. In our study 46% were alcoholic, 72% were smokers and 54% were

vegetarian so among these three only smoking was found to have a significant effect on development of Androgenetic Alopecia. Patients were all affected by different degrees male pattern baldness, ranging from Hamilton class 3 to 6. Maximum cases were of grade III i.e. 38% followed by grade IV (28%). grade V (24%) and grade VI (10%) of cases. (Figure 1)

Figure 1

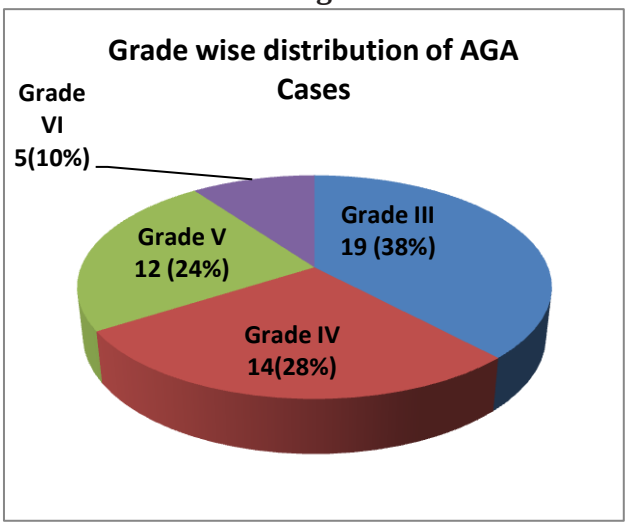
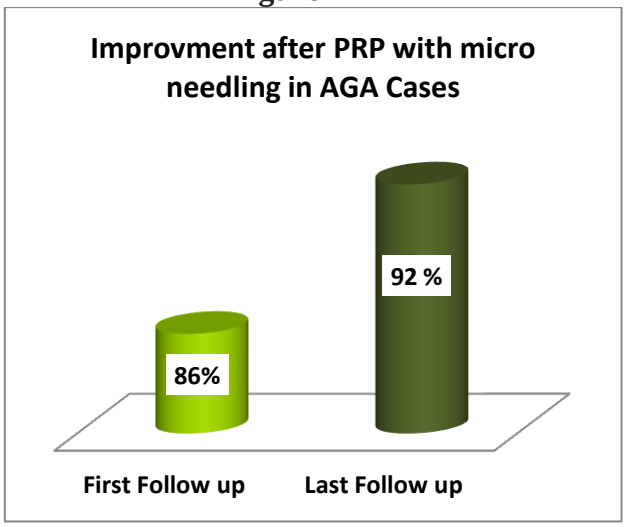


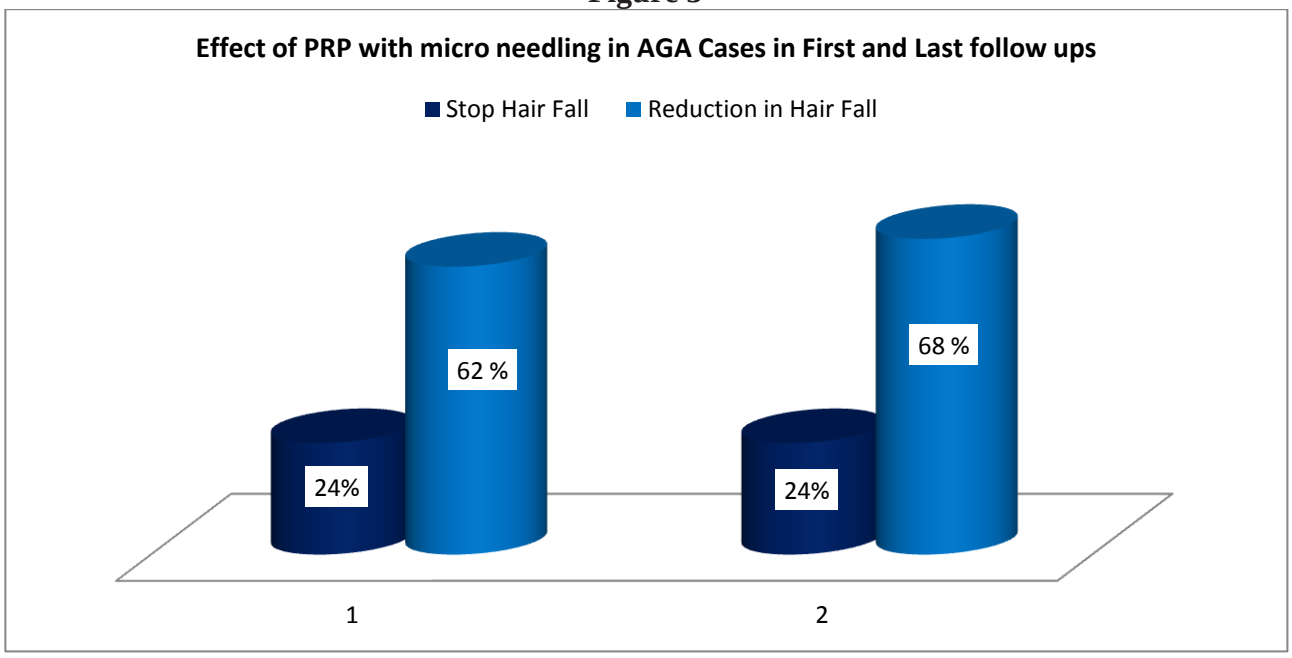
Figure 2



No immediate adverse effects, such as allergic reactions, postoperative pain or fever, prolonged redness, nor delayed side effects such as telogen effluvium were reported.

According to the patients perception after 1st session 86% patient perceived some improvement (24% patients perceived stoppage of hair fall, 62% patients noticed reduction in hair fall) and after last session 92% perceived some improvement (24% patients perceived stoppage of hair fall, 68% patients noticed reduction in hair fall). Mean of hair pull test at first visit was (3.00±1.7261) and after last visit was (1.02±0.9581) which was significantly ($p<0.05$) reduced after last visit. ((Figure 2 & 3)

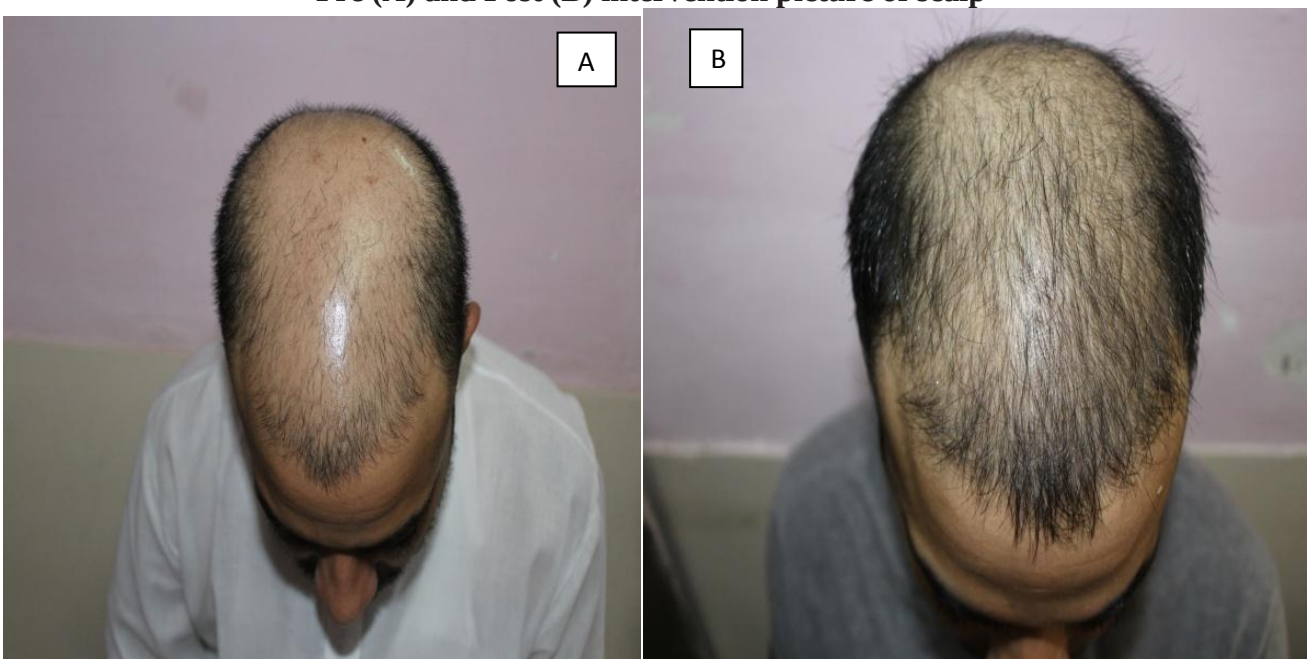
Figure 3



In the present study conducted on 50 patients, 82% patients had no side effects from the therapy given. 18% patients had mild side effects like pain, erythema, burning and edema. All the above side effects observed were reversible.

Some degree of improvement was observed in all patients by both observers. Figure 1 A, B show the condition of a 24-year-old male patient at baseline and at the 6-month follow-up, whereas Figure 2A, B show the condition of a 42-year-old male patient, at the same time points. The visible improvement at follow-up should not be attributed to increased hair length, but rather to an increase in the hair thickness.

Figure 4
Pre (A) and Post (B) intervention picture of scalp

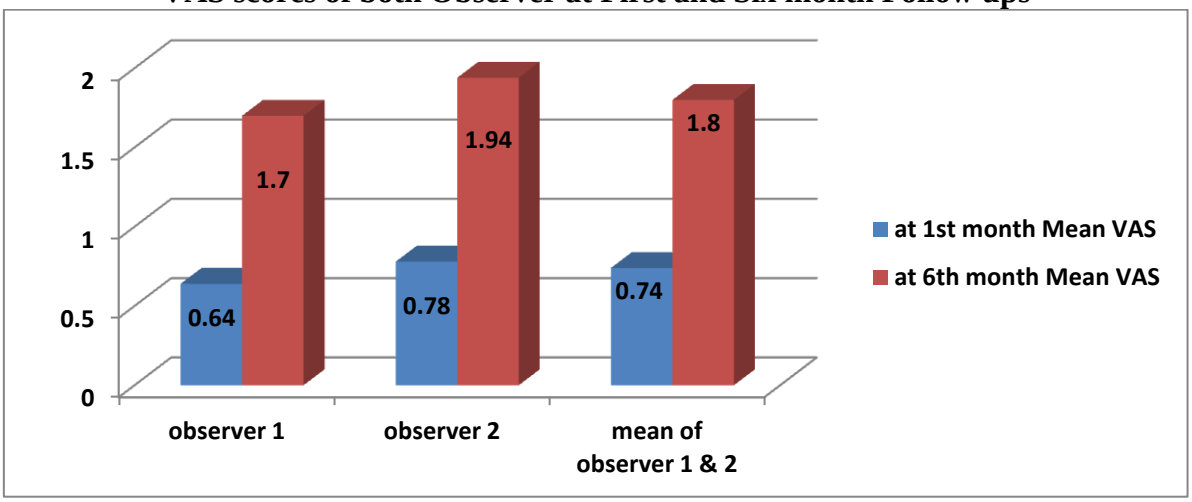


Mean Visual analogue score increased from 0.64±0.598 at first visit to 1.7±0.544 at last visit according to observer 1 and Mean visual analogue score increased from 0.78±0.582 at first visit to 1.94± 0.712 at last visit according to observer 2. Increase in Mean of VAS of both observer was statistically significant because *P* value <0.0001 which is calculated by using paired t test.

Mean VAS of observer 1 was 0.64±0.598 and observer 2 was 0.78±0.582 at 1st visit and Mean VAS of observer 1 was 1.7± 0.544 and observer 2 was 1.94± 0.712 at last visit. Comparison between them was not statistically significant because *P*-value is >.05 it is calculated by using unpaired t test.

Mean of Visual analogue score of both observers increased from 0.74±0.517 at first visit to1.8± 0.505 at last visit which was statistically significant because *P*- value -< 0.0001 and it is calculated by using unpaired t test. (Figure 5)

Figure 5
VAS scores of both Observer at First and Six month Follow ups



IV. DISCUSSION

In this present study 38% of patients were present in the Grade III of Norwood Hamilton Grade and grade IV, V and VI had 28%, 24%, and 10% patients respectively. Trancik et al in 2001 conducted a study on 496 adolescents in the age group of 15-17 yrs and found that (15.5%) subjects were rated as having stage 2 or greater hair loss on the Hamilton-Norwood grading scale but all patients in our study having AGA stage III or higher grade were in the age group of 20-50 years, although number of patients in this study were less.[8]

In this study, 78% participants had family history while 22% participants had no family history of androgenetic alopecia which is comparable to Nyholt DR et al who reported that the major contributing factor to AGA is heredity which accounts for 80% of the variants.[9] Other previous studies in favour of positive family history with AGA are, Trancik et al who found that a family history of AGA was present either on the father's side or the mother's side, or on both sides in most of the cases.[8] *Even* Chumlea WC et al in 2004 concluded that men whose father had hair loss were 2.5 times as likely to have had some level of hair loss compared to men whose father had no hair loss.[10] Savant N et al in 2010 also reported that family history definitely plays a role and appears to be associated with age of onset of hair loss and patients with positive family history seem to present at young age.[11]

In this study we observed that 72% were smokers which correlate with the findings of Trueb RM et al and other previous studies. Trueb RM et al in 2009 concluded that smoking affects the development of AGA because the genotoxic compounds in cigarettes may damage the DNA in hair follicles and subsequently cause microvascular poisoning in hair papillae.[13] Su LH et al conducted a community based survey and found an association between smoking and AGA among Asian men.[14] Lai H et al also found a significant correlation between cigarette smoking and AGA.[12]

In this study, 46% patients were alcoholic and 54% were non alcoholic, so alcohol was not found to contribute in developing male pattern alopecia. This is supported by Iyanda AA et al 2012 in which they state that alcohol consumption was positively correlated with superoxide dismutase but there was no correlation between alcohol and alopecia.[15] But Gatherwright J et al [16] 2013 and Severi G et al [17] 2003 also reported that the consumption of alcohol was associated with a significant increase in risk of frontal and vertex AGA. Probable reason for not founding association between alcohol consumption

and AGA in our study because the most of our patients were in young age group and they may consume less amount of alcohol.

In this study after 1st visit 24% patients perceived stoppage of hair fall, 62% patients noticed reduction in hair fall, 8% of the patients perceived no change in hair fall and remaining 6% patients perceived increased hair fall. And after last visit 24% patients perceived stoppage of hair fall, 68% patients noticed reduction in hair fall , 6% of the patients perceived no change in hair fall and remaining 2% patients perceived increased hair fall. The probable mechanism by which PRP acts was explained by Rinaldi et al (2011) which found that growth factors from PRP could prevent dermal papilla apoptosis, prolong anagen phase, delay catagen and telogen, eventually reducing diffuse hair loss and stimulating hair re-growth in androgenetic alopecia, without side effects during the treatment period and after 12 months from the end of treatment.[18, 19]

Knighton DR et al in 2007 used PRP for the treatment of non-healing wounds and found that topical application of PRP to areas of tissue containing hair follicles showed increased hair growth, where no growth or limited growth was previously observed.[20]

In the present study conducted on 50 patients, 82% patients had no side effects from the therapy given. 18% patients had mild side effects like pain, erythema, burning and edema. All the above side effects observed were reversible.

These results show significant improvement in our patients which is similar to the Schiavone et al (2014) who found improvement in 62/64 patients by Evaluator 1 and in all 64 patients by Evaluator2 and the overall proportion of patients reaching a clinically important difference was 40.6% and 54.7%, according to the 2 evaluators, respectively.[21] Dr. Uebel in 2005, reported that area treated with PRP demonstrated a yield of 18.7 follicular units/cm2 v/s 16.4 follicular units/cm2 of the placebo group, an increase in follicular density of 15.1 %. Greco et al in 2009 observed an increase in hair density of 18.8% at 3 months and 29% at 9 months in patients treated with PRP group.[22]

V. CONCLUSION

PRP with micro needling is an effective combination because micro needling has its own action and it would also help in promoting penetration of PRP but the level of evidence as of now , from the available published data is low , this demands further studies to gain more evidence before it is used more extensively.

CONFLICT OF INTEREST

None declared till now.

REFERENCES

[1] Wadhwa SL , Knopkar U , Nischal KC. “Hair and scalp disorders” In:Valia RG,Valia AR editors IADVL,Textbook of Dermatology,3rd edition:Bhalani publishing house,2008:887-894

[2] Nicole E Rogers and Marc R “medical treatments for male and female pattern hair loss” American J of Dermatol 2008

[3] Sinclair RD. “Disorders of Hair In Burns” T, Breathnach S, Cox N, Griffiths C, editors. Rook’s Textbook of Dermatology. 8th edition. UK: Blackwell Publishing Ltd; 2010: 66.16-66.31

[4] “Treating female pattern hair loss” Harward Health Publications 2009 June.

[5] Zheng Jun Li, Hye In Choi, Dae Kyoung Choi et.al “autologous platelet rich plasma: a potential therapeutic tool for promoting hair growth” American society of dermatology surgery 2012;1-7.

[6] “PRP therapy in hair restoration” Irvine orange country, California, FUE Neograft

[7] Dhurat R, Sukesh MS, Avhad G, Dandale A, Pal A and Pund P. A randomized evaluator blinded study of effect of microneedling in androgenetic alopecia: A pilot study. Int J Trichol (serial online) 2013 (cited 2017 May 26)

[8] Trancik RJ, Spindler JR, Rose S, et al. Incidence of androgenetic alopecia in males 15 to 17 years of age. Poster presented at: 3rd Intercontinental Meeting of the Hair Research Societies June 13-15, 2001.

[9] Nyholt DR, Gillespie NA, Heath AC, Martin NG (2003) Genetic basis of male pattern baldness. J Invest Dermatol 121: 1561–1564.

[10] WC Chumlea, T Rhodes, CJ Girman - Dermatology, 2004 - karger.com Abstract Introduction: The genetic basis of androgenetic alopecia (AGA) is well accepted in the medical community and among the general population. However, rigorous studies investigating the familial basis of AGA are lacking.

[11] Androgenetic Alopecia: Quality-of-life and Associated Lifestyle PatternsNeena Sawant, Siddhi Chikhalkar,[1] Varun Mehta, Malvika Ravi, Bhushan Madke,[1] and Uday Khopkar[1]

[12] Androgenic Alopecia Is Associated with Less Dietary Soy, Higher Blood Vanadium and rs1160312 1 Polymorphism in Taiwanese Communities Ching-Huang Lai,[1] Nain-Feng Chu,[1,2] Chi-Wen Chang,[3] Shu-Li Wang,[4] Hsin-Chou Yang,[5] Chi-Ming Chu,[1,*] Chu-Ting Chang,[1] Ming-Huang Lin,[1] Wu-Chien Chien,[1] Sui-Lung Su,[1] Yu-Ching Chou,[1] Kang-Hua Chen,[3] Wei-Ming Wang,[6] and Saou-Hsing Liou.[1,4]

[13] Oxidative stress in ageing of hair RM Trueb - International journal of trichology, 2009 – Medknow.

[14] Association of androgenetic alopecia with smoking and its prevalence among Asian men: a community-based survey.Su LH[1], Chen TH.

[15] Serum activities of anti-oxidant enzymes and possible involvement of genetic factor in androgenetic alopecia in male Nigerian subjects Iyanda A.A.2012.

[16] The contribution of endogenous and exogenous factors to male alopecia: a study of identical twins. Gatherwright J[1], Liu MT, Amirlak B, Gliniak C, Totonchi A, Guyuron B.

[17] Androgenetic alopecia in men aged 40-69 years: prevalence and risk factors. Severi G[1], Sinclair R, Hopper JL, English DR, McCredie MR, Boyle P, Giles GG.

[18] Rinaldi F, Sorbellini E, Coscera T. "The Role of Platelet Rich Plasma to microneedling anagen phase: Evaluation in vitro & in vivo in Hair Transplant and Hair Treatment". Int J Trichol 2011 (July); 3: supplement.

[19] Sorbellini E. Trink A, Rinaldi F. "Experimental clinical assessment of the use of platelet-rich plasma in dermatology and rationale for its use in the treatment of non-scarring alopecia". Presented at the 35th La Medicina Estetica 4 October 2011

[20] Knighton DR, Hudson, Wis, inventors. Regents of the University of Minnesota, Minneapolis, Minn, Curative Technologies. "Method for Promoting Hair Growth" 1990 (September 18). US Patent 4957742

[21] Platelet-Rich Plasma for Androgenetic Alopecia: A Pilot Study 2014 Giovanni Schiavone, MD,* Desanka Raskovic, MD,† Joseph Greco,

[22] Uebel CO, da Silva JB, Cantarelli D, Martins P. " The role of platelet plasma growth factors in male pattern baldness surgery". Plast Reconstr Surg 2006; 118(6): 1458–66