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Long-term outcomes of microneedling and CGF on hair regrowth in patients with androgenetic alopecia a clinical evaluation

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Abstract
Background: A common disorder causes its victim to suppress their self-esteem and to affect their physical health. Androgenetic alopecia refers to pattern hair loss in men and women. It is a disorder of hormonal imbalance that is related to genes. Concentrated growth factor (CGF) combined with a modern medical tool; microneedling are very effective therapeutic approach to treat this unwanted disease.
Objective: This study primarily aims to determine the long-term outcomes of microneedling and CGF on hair regrowth in patients with diagnosed androgenetic alopecia serving some secondary objectives like gender and age-related impacts on androgenetic alopecia.
Methodology: Two-year evaluation on androgenetic alopecia on a sum of 20 healthy patients. The clinical management team collected the patient's plasma samples to prepare CGF factors and to inject it carefully into the study subject's scalp by 1.5-2 mm microneedles. Data was collected manually on CRF and analyzed by MS Excel and SPSS version 20.0. Graphical representation with p-value determination has been done to represent the study data.
Results: This male-dominant study ended with a 1:5.67 ratio of females and males where the p=0.0001 value indicates that intervention therapy is highly significant for patients with androgenetic alopecia. The significance of the age factor, p>0.05 shows that there is no relationship between microneedling and CGF on hair regrowth and patient's long-term effectiveness. No remarkable adverse reaction is noted in this study.
Conclusion: The present study concluded with a promising hair regrowth technique for patients with androgenetic alopecia. It contributes to a better long-term clinical outcome regarding the therapy and patient satisfaction.

Keywords: Androgenetic alopecia, pattern hair loss, concentrated growth factor, hair regrowth, microneedling

Introduction

Androgenetic alopecia (AGA) is a familiar hair loss pattern that affects both males and females. It refers to "pattern hair loss" [1] characterized by losing hair in the scalp's frontal, temporal, and crown regions. Androgen is a human gonadotropic hormone that is secreted from the adrenal cortex and responsible for sexual and reproductive functions [2]. When a body shows excessive response to androgen hormone, it is affected by Androgenetic alopecia-like disorders [3]. Although AGA is a genetically predetermined disorder in 85% of males and 40% of females [4], the clinical manifestation and the pattern of hair loss varies with gender. In males, AGA caused baldness but in females, hardly any baldness was observed. AGA's mechanism involves converting androgen and testosterone hormones to the more active dihydrotestosterone (DHT) by the enzyme 5α-reductase (5αR). DHT receptor is a protein receptor that lies in the frontal and crown area of the scalp which binds with protein and accumulates with protein in the root of the hair. Accumulation of excess protein in the hair root interrupts blood circulation, followed by a thinning hairline and hair loss [5, 6]. Androgenic alopecia is observed in male patients mostly after the age of 50 [7] but Hyperandrogenemia, PCOS, obesity, hypothyroidism, Hypertension, prostate and thyroid

cancer are some comorbidities that increase the risk of androgenetic alopecia at any age [4]. Worldwide 50% of men and 30% of female patients are victimized by AGA [8]. Microneeding is known as a safe, effective, minimal invasive modern dermatological procedure that uses 1.5 to 2mm of needles to inject medicinal products into its targeted areas. Wide ranges of therapeutic benefits are associated with microneedling and some research justifies its effectiveness with androgenetic alopecia too [9]. CGF refers to Concentrated Growth Factors that are plasma-derived cross-linked fibrin glue used to treat patients with AGA. Studies have found the potency of CG factors in the treatment of androgenetic alopecia without any notable adverse effects [10]. This study focuses on the effectiveness of CGF by microneedling in patients with androgenetic alopecia by the determination of hair growth with time variables.

Materials and Methods: The study was conducted in the Department of Skin and Venereology, Dhaka National Medical Institute hospital in 2021-2023 following the principle of the Declaration of Helsinki. 20 healthy patients with a history of androgenetic alopecia participated in this prospective clinical trial. A total of 10 mL of blood samples were withdrawn from individual patients in the purple EDTA tube to extract plasma samples. After centrifuging the blood samples for 10 minutes at 3400 rpm, the plasma and blood separated. Plasma supernatant was collected and used to prepare concentrated Growth factors to treat patients [10]. The long-term and final assessment of the study subject will be considered as 1-year follow-up after therapy.

Inclusion criteria

a) Patients aged over 16 years with a diagnosis history of stable androgenetic alopecia
b) Dermoscopy is the key diagnosis test to confirm AGA
c) Non-allergic to microneedles
d) History of no contact dermatitis
e) No significant underlying health condition to manipulate hair growth by CGF microneedling

Exclusion criteria

a) Children aged patient <16 years
b) Patients who do not require any therapy for AGA
c) Autoimmune disorders
d) Circulation system disorders
e) Self-reported known pregnancy
f) Hypersensitivity to microneedles
g) Lack of informed consent

Outcome-determining variables are patient-specific demographic conditions like age, sex, and hair regrowth in patients by intervention period. Visual assessment by previously determined scale and patient satisfaction rate is preferred to identify hair regrowth parameters. MS Excel and SPSS version 20.0 software were used as data analysis tools with manual case report forms. A p-value less than 0.05 was considered significant in the statistical analysis.

Results

Figure I shows the percentage of patients to get affected by Androgenetic Alopecia. The ratio of female and male participants in this clinical trial is 1:5.67.

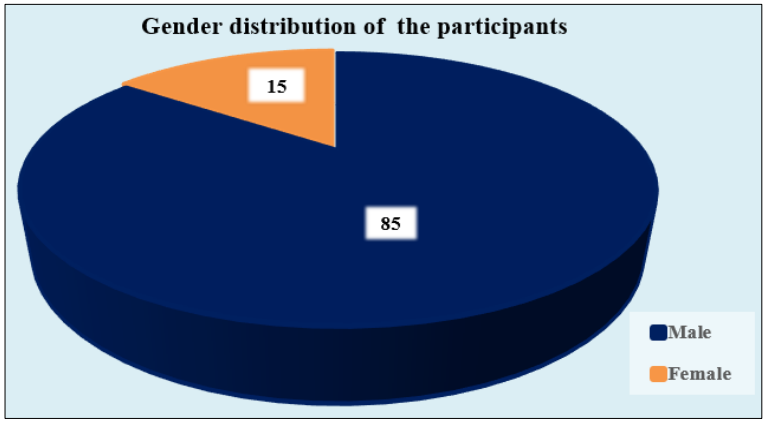

Fig 1: Pie chart showed gender wise patients distribution (N=20)

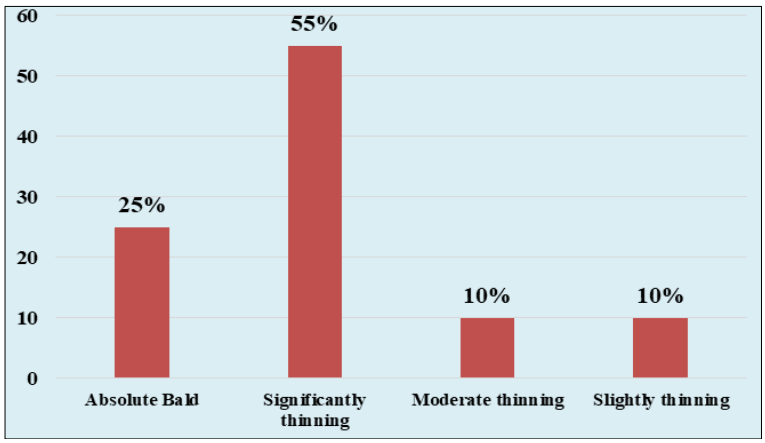

Fig 2: Baseline patient's condition

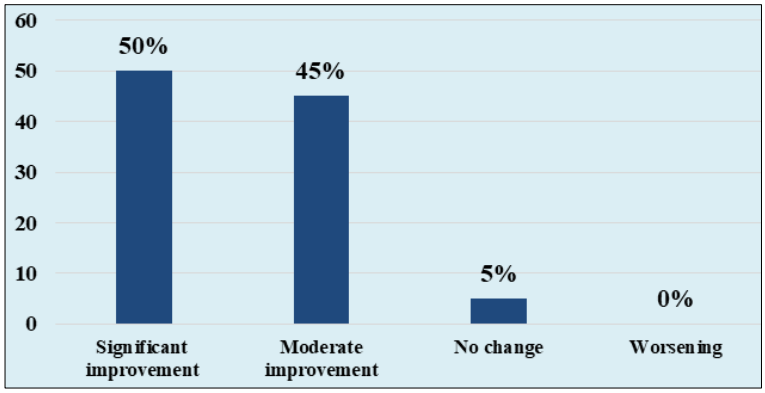

Fig 3: After therapy patients condition

Figure II and Figure III reflect the patient's condition at baseline and after therapy. At baseline, 25% of patients reported baldness with 55% of patients significant thinning. After therapy, 50% of patients were assessed by significant improvement with 45% moderately improving. No worsening condition has been detected.

Table 1: One sample T-test for baseline and after therapeutical condition of patients (N=20)

Variables	Mean Difference	Std. Deviation	P-value
Baseline	1.550	0.887	0.0001
After therapy	2.050	0.605	

One sample T-test shows a significant change in the patient's before and after therapy Condition which implies that CGF by microneedling therapy is highly significant in improving Androgenic alopecia.

Table 2: Intervention impact on patient's age (N=20)

Age group	Significant improvement	Moderate improvement	No change	P-value
16-25 years	0	100%	0	0.048[c]
26-35 years	57.14%	28.57%	14.28%	
36-45 years	80%	20%	0	
46-55 years	50%	50%	0	
>56 years	100%	0	0	

p>0.05 indicates that age has no significant effect on a patient's hair regrowth therapy. Patients of any age will receive the same impact from CGF microneedling therapy for Androgenic alopecia.

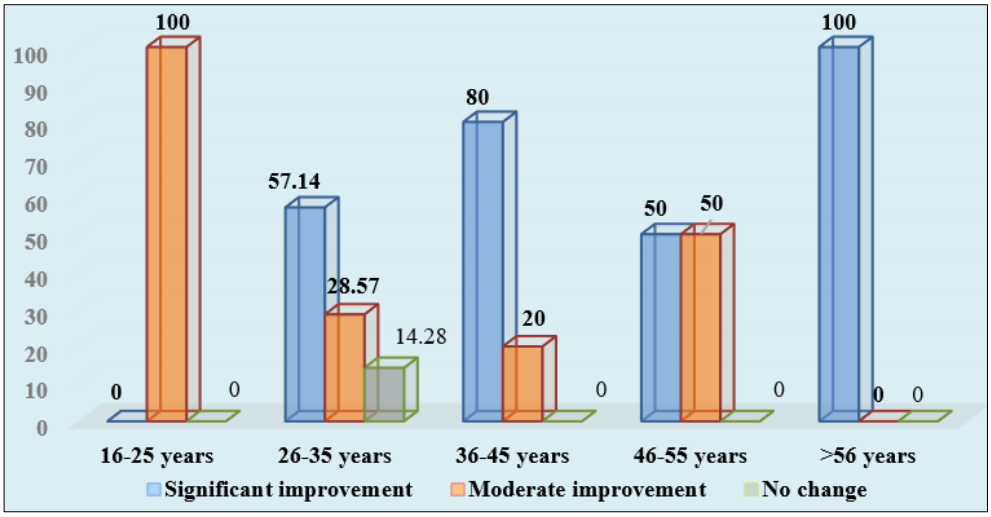

Fig 4: Column chart showed intervention impact on patient's age (N=20)

Table 3: Patient satisfaction by intervention (N=20)

Satisfaction level	Frequency	Percentage
Very Dissatisfied	0	0%
Dissatisfied	2	10%
No comments	2	10%
Satisfied	9	45%
Very Satisfied	7	35%
Total	20	100%

35% of Androgenetic alopecia patients showed absolute satisfaction with this trial, 45% were satisfied and 10% patients were not satisfied with this therapy.

Discussion

Androgenetic alopecia is a dermatological disorder that affects greatly on a patient's mental and physical health. The findings of this clinical trial prove that microneedling

combined with CGF therapy has a great long-term impact on hair regrowth in patients with adrogenetic alopecia. The mode of action of microneedles is to puncture the scalp to produce collagen [11] and to stimulate stem cells to activate growth hormones [12]. Reduction of growth factors (VEGF, KGF, EGF, TGF-β1) in the scalp can highly influence a man's or woman's health to develop androgenetic alopecia [13]. In this study, we found that 85% of our study subjects are the man that indicates that androgenetic alopecia is more prevalent in men than women which is similar to some other studies [14, 3]. 50% of patients responded significantly towards microneedling combined with CGF therapy, p-value=0.0001 also reveals a significant positive impact on patient's condition by this intervention. Previous researchers proved the effectiveness of microneedles and CGF factors on androgenetic alopecia separately [9, 15, 10, 16]. Likewise, other scientists, there are no findings of worsening conditions and adverse events in this retrospective clinical evaluation which denotes that Microneedling and CGF on Hair Regrowth is a completely safe procedure that can be done at any age [9, 17]. The current study also attempted to analyze the age-related therapeutic impact of CGF microneedling but the result manifested this therapy is not associated with age. Every aged person will receive the same outcome. A study with high satisfaction of patients signifies its positivity on humanity. This clinical evaluation justifies that criteria with 35% very satisfied and 45% satisfied patients.

Limitation

This study relates to the long-term outcome of microneedling and CGF on hair regrowth in androgenetic alopecia patients which is its primary shortcoming. Future studies are required to find out the onset of action of the therapy. The study did not find any adverse events in patients, yet, future studies are recommended to design by closely monitoring patients to ensure the safety of the treatment.

Conclusion

The study summarizes that microneedling and concentrated growth factors have the potentiality to treat patients with androgenetic alopecia by hair regrowth. This synergistic treatment option allows patients to promote hair regrowth through a safe, well-tolerated, and painless method. The success of this study suggests that CGF and microneedle stimulate hair follicles and provide good scalp health. The initial long-term outcomes of microneedling and CGF therapy is positive, promising, and beneficial for mankind.

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