

Comparative study between Minoxidil intradermal injection by derma pen versus dutasteride intradermal injection by derma pen and derma pen alone in the treatment of male pattern baldness

Mai Mahmoud Abdel Hamed Hassan¹, Faten Abdel Wadood Abdel Kawy²,
Marwa Said Mahmoud²

¹Medical Administration at AL-Azhar University, Cairo, Egypt

²Department of Dermatology and Venereology, Faculty of Medicine for Girls - Al Azhar University, Cairo, Egypt

Corresponding author: Mai Mahmoud Abdel Hamed Hassan, **Mobile:** 01000409940

Abstract

Background: *Androgenetic Alopecia is a hereditary non-scarring androgen-dependent progressive thinning of the scalp.*

Objective: *To compare between minoxidil intradermal injection by derma pen versus dutasteride intradermal injection by derma pen and derma pen alone in the treatment of male pattern baldness.*

Patients and Methods: *This study was conducted on 45 Egyptian males with androgenetic alopecia collected from the Al-Zahraa outpatient clinic from the period 2018 to 2019. Approval from the Research Ethics Committee of Faculty of Medicine for Girls, AL-Azhar University was obtained. All of the participants gave informed consent to participate in the study.*

Results: *In the current study, other adverse effects, such as impotence, ejaculation disorder, or gynecomastia, were not reported. No serious adverse effects were reported. No local side effects in the current study may due to appropriate sterilization of the device and the use of only fully licensed and tested agents together with micro-needling are important.*

Conclusion: *Our study proved that dutasteride, minoxidil injection, and derma pen injection are an effective, safe, and trustworthy treatment for male androgenetic alopecia patients. Treatment of male androgenetic alopecia at any age and any BASP grade of androgenetic alopecia is possible and effective. Therefore, the study concluded that starting treatment at a younger age and earlier stage of androgenetic alopecia give better results.*

Keywords: *Androgenetic alopecia, Dihydrotestosterone*

INTRODUCTION

Androgenetic alopecia (AGA) is the main cause of hair loss in men and women.¹²

In most men AGA develops with a distinctive “patterned” hairline recession, a receding front line is observed, mainly of triangular shape, followed by thinning at the vertex area.¹⁸

Hair follicles are complex structures that go through different biological stages: from an active growth stage (anagen phase) and an intermediate remodeling stage (catagen phase) to a quiescent stage (telogen phase).¹⁶

The pathogenesis of androgenetic alopecia is characterized by a shortening of the anagen phase and an increase in the number of hair follicles that remain in the telogen phase. Since the anagen phase determines hair's length.⁷

AGA is a disorder of multifactorial origin, in which genetics plays an important role. In males, it is an androgen-dependent feature since the terminal follicle becomes susceptible to Dihydrotestosterone (DHT), shortening the anagen phase.¹⁶

The treatment modalities vary from medical treatment such as minoxidil, 5-alpha-reductase inhibitors, to surgical modality as hair transplantation.¹⁴

Minoxidil used orally is an antihypertensive vasodilator but is used topically for hair loss treatment that elongates anagen duration, shortens the telogen period, and helps in recovering miniaturized hair follicles.⁵

Dutasteride is 5-Alpha Reductase (5AR) inhibitor, it inhibits type (2) 5AR, the main isoenzyme involved in AGA pathogenesis.¹⁷

Microneedling is a minimally invasive dermatological procedure in which fine needles are rolled over the skin to puncture the stratum corneum. This therapy is used to induce collagen formation.⁸

AIM OF THE WORK

This study aims to compare minoxidil intradermal injection by derma pen versus dutasteride intradermal injection by derma pen and derma pen alone in the treatment of male pattern baldness

PATIENTS AND METHODS

This study was conducted on 45 Egyptian males with androgenetic alopecia collected from Al-Zahraa outpatient clinic from the period of 2018 to 2019. Approval from the Research Ethics Committee of Faculty of Medicine for Girls, AL-Azhar University was obtained. All of the participants gave informed consent to participate in the study.

Inclusion criteria:

Age; between 18 to 45 years old. All grades of androgenetic alopecia were included according to basic and specific classification (BASP).

Exclusion criteria:

Any patient who received systemic hair treatment in the previous 6 months. Patients with severe systemic illness or malignancy. Patients with any scalp dermatological disease. Systemic use of corticosteroids or corticosteroid injection at the scalp should be stopped within one month before the study. History of keloidal scarring. Anticoagulant therapy or aspirin should be stopped at least 3 days before the procedure.

Assessment of patients:

General history was taken from every patient to exclude another dermatological disease, history of onset (sudden, gradual), course (progressive, regressive, stationary), duration of androgenetic alopecia, history of thinning and shedding, family history of androgenetic alopecia and history of use of cosmetic formulas (example gel, dyes, and chemicals). Dermatological examination to exclude other scalp diseases. Classification of androgenetic alopecia using basic and specific classification.⁹(Figure 1)

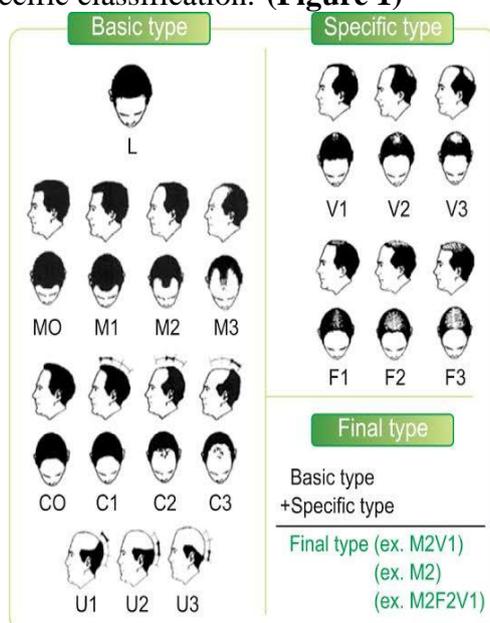


Figure (1): Basic type and specific type.⁹

Clinical assessment of AGA:

Distribution and grading of hair loss were assessed according to The Basic and specific classification (all participants were assessed by the same observing doctor). **Group 1:** 15 patients were injected with minoxidil 5% by derma pen. **Minoxidil 5%:** ampoule containing 5% of the drug. 1 mg of minoxidil was injected without dilution by derma pen at linear method, the microneedles used had 36 needles were of 1 mm length. **Group 2:** 15 patients were injected with dutasteride 0.5 by derma pen. **Dutasteride:** ampoule containing 0.05% of the drug. 1 mg of dutasteride were injected as minoxidil without dilution by derma pen. **Group 3:** 15 patients were injected with derma pen only at the linear method. All patients received eight-session scalp treatment with two weeks interval, first, we examined the scalp and hair density using trichoscopy at the first session then at the last session.

RESULTS

Table (1): Demographic data of the studied group.

| | | Minoxidil group | Dutasteride group | Derma pen group | Test value | P-value | Sig. |
|------------------------|-----------|-----------------|-------------------|-----------------|------------|---------|------|
| | | No.% | No.% | No.% | | | |
| Age | Mean ± SD | 25.53 ± 7.10 | 27.20 ± 6.59 | 25.20 ± 5.51 | 0.416 | 0.662 | NS |
| | Range | 20 – 39 | 20 – 36 | 19 – 39 | | | |
| Duration (Years) | Mean ± SD | 2.27 ± 1.10 | 2.47 ± 1.19 | 2.33 ± 1.18 | 0.117 | 0.890 | NS |
| | Range | 1 – 4 | 1 – 4 | 1 – 4 | | | |
| History of drug intake | No | 15 (33.3%) | 15 (33.3%) | 15 (33.3%) | NA | NA | NA |
| | Yes | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | | | |
| Family history | No | 4 (40.0%) | 3 (30.0%) | 3 (30.0%) | 0.257 | 0.879 | NS |
| | Yes | 11 (31.4%) | 12 (34.3%) | 12 (34.3%) | | | |

P-value >0.05: Non significant (NS); P-value <0.05: Significant (S); P-value < 0.01: highly significant (HS)

*: Chi-square test; One Way ANOVA test

Table (2): Comparison between the three groups before treatment.

| Before | Minoxidil group | Dutasteride group | Derma pen group | Test value | P-value | Sig. |
|----------------|-----------------|-------------------|-----------------|------------|---------|------|
| | | | | | | |
| M total | 9 (100%) | 5 (100%) | 5 (100%) | 1.679 | 0.432 | NS |
| Preserved | 4 (44.4%) | 4 (80.0%) | 3 (60.0%) | | | |
| Regressed | 5 (55.6%) | 1 (20.0%) | 2 (40.0%) | | | |
| F total | 8 (100.0%) | 7 (100.0%) | 9 (100.0%) | 4.531 | 0.104 | NS |
| Preserved | 3 (37.5%) | 1 (14.3%) | 6 (66.7%) | | | |
| Regressed | 5 (62.5%) | 6 (85.7%) | 3 (33.3%) | | | |
| C total | 3 (100.0%) | 7 (100.0%) | 5 (100.0%) | 3.171 | 0.205 | NS |
| Preserved | 0 (0.0%) | 2 (28.6%) | 3 (60.0%) | | | |
| Regressed | 3 (100.0%) | 5 (71.4%) | 2 (40.0%) | | | |
| U total | 3 (100.0%) | 2 (100.0%) | 2 (100.0%) | 0.000 | 1.000 | NS |
| Preserved | 3 (100.0%) | 2 (100.0%) | 2 (100.0%) | | | |
| Regressed | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | | | |

Table (3): Comparison between the three groups after treatment.

| After | Minoxidil group | Dutasteride group | Derma pen group | Test value | P-value | Sig. |
|----------------|-----------------|-------------------|-----------------|------------|---------|------|
| | | | | | | |
| M total | 9 (100%) | 5 (100%) | 5 (100%) | 3.958 | 0.138 | NS |
| Preserved | 9 (100.0%) | 4 (80.0%) | 3 (60.0%) | | | |
| Regressed | 0 (0.0%) | 1 (20.0%) | 2 (40.0%) | | | |
| F total | 8 (100.0%) | 7 (100.0%) | 9 (100.0%) | 1.739 | 0.419 | NS |
| Preserved | 8 (100.0%) | 7 (100.0%) | 8 (88.9%) | | | |
| Regressed | 0 (0.0%) | 0 (0.0%) | 1 (11.1%) | | | |
| C total | 3 (100.0%) | 7 (100.0%) | 5 (100.0%) | 3.333 | 0.189 | NS |
| Preserved | 2 (66.7%) | 7 (100.0%) | 3 (60.0%) | | | |
| Regressed | 1 (33.3%) | 0 (0.0%) | 2 (40.0%) | | | |
| U total | 3 (100.0%) | 2 (100.0%) | 2 (100.0%) | 0.000 | 1.000 | NS |
| Preserved | 3 (100.0%) | 2 (100.0%) | 2 (100.0%) | | | |
| Regressed | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | | | |

Table (4): Comparison between the three groups according to Trichoscopic findings before treatment.

| Before | | Minoxidil group | Dutasteride group | Derma pen group | Test value* | P-value | Sig. |
|-------------|---------|-----------------|-------------------|-----------------|-------------|---------|------|
| | | No. = 15 | No. = 15 | No. = 15 | | | |
| Yellow dots | Mean±SD | 64.67 ± 18.46 | 58.00 ± 24.26 | 57.33 ± 19.07 | 0.572 | 0.569 | NS |
| | Range | 40 – 90 | 20 – 90 | 20 – 90 | | | |
| Diversity | Mean±SD | 60.67 ± 22.51 | 53.33 ± 25.26 | 65.33 ± 17.67 | 1.13 | 0.333 | NS |
| | Range | 20 – 90 | 20 – 90 | 40 – 90 | | | |
| Single hair | Mean±SD | 38.67 ± 11.87 | 36.67 ± 12.34 | 39.33 ± 14.38 | 0.173 | 0.841 | NS |
| | Range | 20 – 60 | 20 – 60 | 20 – 60 | | | |

Table (5): Comparison between the three groups according to Trichoscopic findings after treatment.

| After | | Minoxidil group | Dutasteride group | Derma pen group | Test value• | P-value | Sig. |
|-------------|---------|-----------------|-------------------|-----------------|-------------|---------|------|
| | | No. = 15 | No. = 15 | No. = 15 | | | |
| Yellow dots | Mean±SD | 42.00 ± 14.24 | 35.33 ± 20.91 | 44.00 ± 18.44 | 0.945 | 0.397 | NS |
| | Range | 20 – 70 | 10 – 80 | 10 – 80 | | | |
| Diversity | Mean±SD | 36.00 ± 16.39 | 33.00 ± 17.09 | 46.00 ± 21.65 | 2.026 | 0.145 | NS |
| | Range | 10 – 60 | 10 – 60 | 20 – 80 | | | |
| Single hair | Mean±SD | 21.33 ± 9.15 | 21.00 ± 9.10 | 25.33 ± 14.57 | 0.69 | 0.507 | NS |
| | Range | 10 – 40 | 10 – 40 | 10 – 50 | | | |

Table (6): Comparison between the three groups according to patient satisfaction.

| Satisfaction | Minoxidil group | | Dutasteride group | | Derma pen group | | Test value | P-value | Sig. |
|-----------------------|-----------------|-------|-------------------|-------|-----------------|-------|------------|---------|------|
| | No. | % | No. | % | No. | % | | | |
| No Satisfaction | 3 | 23.1% | 0 | 0.0% | 10 | 76.9% | 24.420 | 0.000 | HS |
| Mild Satisfaction | 3 | 27.3% | 3 | 27.3% | 5 | 45.5% | | | |
| Moderate Satisfaction | 4 | 50.0% | 4 | 50.0% | 0 | 0.0% | | | |
| Very Satisfaction | 5 | 38.5% | 8 | 61.5% | 0 | 0.0% | | | |

P-value >0.05: Non significant (NS); P-value <0.05: Significant (S); P-value < 0.01: highly significant (HS)

*: Chi-square test

DISCUSSION

Androgenetic alopecia (AGA) or male patterned baldness is a genetically determined hair disorder characterized by a progressive transformation of terminal hair (pigmented, thick and visible) into fine, non-pigmented vellus hair due to the decreasing activity and size of scalp hair follicles. In men, this results in receding frontal hairline and balding at the top of the head, which gradually enlarges and merges.¹³

On the other hand, dutasteride, an inhibiting agent of both type I and type II 5 alpha-reductase, at a dose of 0.5 mg/d was proved to reduce serum DHT levels by more than 90% and significant improvement of AGA.⁴ and ⁶

Currently, there is not enough evidence to show the merit and demerit of the two drugs. So, the current study aimed to compare minoxidil intradermal injection by derma pen versus dutasteride intradermal injection by derma pen and derma pen alone in the treatment of male pattern baldness.

Our comparative cross-sectional study was conducted on 45 male patients complaining of androgenetic alopecia. They classified into 3 groups: Group 1; 15 male patients treated by dutasteride 0.5% by derma pen injection, Group 2; 15 male patients treated by minoxidil 5% by derma pen injection, Group 3: 15 male patients treated by derma pen injection only.

Statistical analysis of our findings revealed that there was no statistically significant difference before and after treatment by dutasteride group as regard M and U types however,

there was good improvements in C and F types after dutasteride injections with a highly statistically significant difference between them.

In the current study, a highly statistically significant difference was found before and after treatment by minoxidil in group 2 as regard M and F BASP subtypes, however; there was no statistically significant difference before and after treatment in C and U.

In the current study, no statistically significant difference was found before and after treatment by derma pen only as regard trichoscopic features of AGA. Similarly, ¹¹ revealed that most of the patients (93.33%) showed gradual onset of hair loss, and the progressive course was reported in all patients with no statistically significant difference between the two groups as regards onset, and degree of hair loss.

In the current study, there was a statistically significant decrease in yellow dots, diversity of hair, and single hair in dutasteride and minoxidil groups as regard trichoscopic findings before and after treatment.

In the current study, no statistically significant difference was found between the three groups before and after treatment in the diversity of hair and single hair as regard Trichoscopic findings. Our results are consistent with a previous study by.¹

Regarding the patient's self-assessment; there was a highly statistically significant difference between the three groups as regard patient satisfaction. Patients in the dutasteride group were more satisfied than patients in the minoxidil group and the last one was more satisfied than derma pen alone ($p < 0.01$).

In our study, none of the participants experienced any skin burning, itching, erythema, swelling, or scaling after applying minoxidil and dutasteride derma pen injections. These results are consistent with the previous study; of micro-needling using dutasteride-containing solutions; by.¹ which reported minimal side effects in the form of mild pain and headache. This suggests the potential safety of local DST. These results were in agreement with.¹⁵ study that reported results of the safety of micro-needling with DST.

In the current study, no cases were reported to have an infection, ecchymosis, itching, or puffed eyes. No one of the patients complained of sexual disturbance, breast enlargement, or tenderness. These results were in agreement with.² and ¹⁰ studies. This is maybe since, the microchannels close immediately after the application, infection is not expected after the procedure.³

In the current study, other adverse effects, such as impotence, ejaculation disorder, or gynecomastia, were not reported. No serious adverse effects were reported. No local side effects in the current study may due to appropriate sterilization of the device and the use of only fully licensed and tested agents together with micro-needling are important.

CONCLUSION

The results of our study proved that dutasteride, minoxidil injection, and derma pen injection are an effective, safe, and trustworthy treatment for male androgenetic alopecia patients. Treatment of male androgenetic alopecia at any age and any BASP grade of androgenetic alopecia is possible and effective. Therefore, the study concluded that starting treatment at a younger age and earlier stage of androgenetic alopecia give better results. Using dutasteride, minoxidil injection, and derma pen injection for the treatment of male androgenetic alopecia, satisfactory results were obtained, as being assessed by the trichoscopy, which showed a significant increase in hair density, single hair, and decrease in yellow dots, as well as the treatment, gave cosmetically acceptable results. The BASP grade classification is an effective grading technique in predicting the improvement achieved in treating male patients of androgenetic alopecia.

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