THE EFFECT OF TOPICAL BIMATOPROST 0.03% SOLUTION ON ANDROGENIC ALOPECIA

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ABSTRACT Background: Androgenic alopecia (AGA) is a pattern of hair loss in men and women characterized by progressive miniaturization that does not cause scarring of hair follicles. Prostaglandin analogues have been recognized as being capable of inducing hypertrichosis. Objective: To determine the effect and safety of bimatoprost on androgenic alopecia. Methods: Eight subjects diagnosed with androgenic alopecia based on history, physical examination and dermoscopy, were given one drop ($\approx$ 50µL) bimatoprost 0.03% in the target area of therapy once a day for 12 weeks. A dermoscopy was used to measure the diameter and number of vellus hairs (hair with a diameter less than 1mm). Result: All target areas of therapy showed an increase in the velus hair diameter after therapy. Conclusion: This study shows that the 12-week topical application of bimatoprost 0.03% solution results in a significant increase in vellus hair diameter.

KEYWORDS bimatoprost, androgenic alopecia, vellus hair, diameter

Introduction

Androgenic alopecia (AGA) is a pattern of hair loss in men and women characterized by progressive miniaturization that does not cause scarring of hair follicles with a distribution pattern that tends to occur in men compared to women.[1] In AGA, shortening of the anagen phase, which shifts the anagen and telogen ratios in the scalp that do not experience baldness from about 12:1 to less than 5:1.[2] The aetiology of AGA is multifactorial and polygenetic. Male AGA (MAGA) is an androgen-dependent condition that caused by genetic predisposition even though inheritance mode is still unclear.[1] Generally, treatment of AGA can be divided to androgen-dependent agonist and antiandrogen independent. Androgen-dependent agonists drugs act against androgens, and anti-androgen independent drugs work through a variety of mechanisms other than hormones, such as minoxidil, and prostaglandin analogues.[3] Latanoprost and bimatoprost were used to decrease ocular pressure in glaucoma, and incidentally, hair lengthening was observed. Based on recent evidence, latanoprost and bimatoprost induced human hair lightening probably due to its functions as an analogue prostaglandine that stimulated hair follicle growth.[4] Garza et al. in their study showed due to the positive effect of prostaglandin E2 (PGE2) and prostaglandin F2α (PGF2α) on hair growth. [5] This study aims to determine the effect of bimatoprost on androgenic alopecia based on diameter and number of vellus hair count.

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Patient and Methods

The study was conducted in the Department Dermatology, and Venereology has Hasanuddin University Teaching Hospital approved by Ethics Commission from Faculty of Medicine, Hasanuddin University. This study used a clinical trial research design with prospective pre-and post-treatment methods. The inclusion criteria were men aged 20-40 years with androgenic Norwood-Hamilton alopecia degree $\geq$ III, willingness to maintain the same hairstyle, length and colour of hair during the study, agree and sign the informed consent form. The exclusion criteria were using a low-level light comb for hair care, using topical steroids / NSAIDs on the scalp and patients suffering from scalp infections and various disorders of the scalp. All patients who had been diagnosed with androgenic alopecia (history, physical examination and dermoscopy) were given one

drop (≈ 50µL) bimatoprost 0.03%, at the target area of therapy once a day for 12 weeks. The target therapeutic area was marked using a nonpermanent tattoo. Evaluation of the vellus hair was zone using a dermoscope before treatment at the first visit, four weeks, eight weeks and 12week after treatment.

Results

From 8 subjects, there were three subjects in the 20-29 years age group (37.5%) and five people in the 30-39 years age group (62.5%). Seven people (87.5%) had a family history of androgenic alopecia, and one person (12.5%) did not have a history of alopecia.

Paired t-test

Table 1 shows the increase in vellus hair diameter after 4, 8, and 12 weeks of bimatoprost treatment. It was shown that the hair diameter significantly increased in week 4, 8, and 12 compared to the baseline value ($p<0.05$).

Table 1 Increase in Vellus Hair Diameter.

Time of Measurement	N	Mean	SD	p
Diameter				
T0-4	8	0,0112	0,006	0,002
T0-8	8	0,0202	0,005	0,000
T0-12	8	0,0211	0,008	0,000

Table 2 shows the hair count at week 4,8, and 12 did not significantly different compared to week 0 before treatment ($p>0.05$).The observed side effects were pruritus (3 subjects) and erythema (3 subjects).

Table 2 Increase in Vellus Hair Count

Time of Measurement	N	Mean	SD	p
Diameter				
T0-4	8	6,625	15,82	0,275
T0-8	8	4,5	20,60	0,556
T0-12	8	5,37	19,37	0,458

Discussion

Alopecia is a common complaint that is often found in dermatologic practice. Androgenic alopecia (AGA) is seen in about 70% of the population.[6] Yeo et al. found that men contributed to nearly two-thirds of patients with AGA.[7] Currently approved treatment options for AGA are finasteride and topical minoxidil.[6] Other alternative therapies are prostaglandin analogues, bimatoprost and latanoprost, which show hair growth effect on eyebrows and eyelashes.[8]

In our study, we observe a hair growth effect denoted by an increase in vellus diameter on subjects suffering from AGA. This result is also in accordance with the research observing the effect of topical bimatoprost 0.03% conducted by Duke University which showed a 78% increase in vellus hair count compared to the placebo after 16 weeks of therapy [9] However, a significant increase in the vellus hair count was not demonstrated in this study, suggesting that bimatoprost works by increasing the diameter of the hair but does not affect the amount of hair.

Recent studies have shown that PG inhibits hair growth and promotes the onset of catagen and decrease hair lengthening, leading to the increase in telogen follicles and miniaturization of the hair follicle, features that are characteristics of AGA.[5] In addition, there is also a dysregulation of PG where PGD2 inhibits hair growth and thus represents a negative counterbalance to the positive effects on hair growth shown for PGE2 and PGF2α.[10] A recent study from Garza et al., showed that the level of Prostaglandin D2 synthase (PTGDS) in the alopecic area of men with AGA was higher than the normal area.[5]

Bimatoprost is a prostaglandin analogue thought to induce hair growth through a direct and indirect action on hair follicles.[10] An in vivo study showed that bimatoprost induced hair growth by targeting the follicular prostanoid receptors. Also, an indirect effect on the blood vessels and surrounding tissues involvement was also observed.[11] The effect of bimatoprost towards hair growth was first suggested when it was found to lengthen eyelashes, possibly through increasing the number of eyelash follicles in the anagen phase as well as prolonging this phase. Furthermore, bimatoprost is also suggested to cause an increase in melanogenesis as well as dermal papilla and hair bulb, leading to darker and coarser lashes.[10] Reported side effects found during the study were pruritus and erythema which can be caused by several possibilities. In our study, it can be caused by an uneven application on the target area.

Conclusion

This study shows that 12-week topical application of bimatoprost 0.03% solution results in a significant increase in vellus hair count. Future studies with longer follow-up period and a larger population should be conducted to confirm this finding.

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