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Role of Caffeine in the Management of Androgenetic Alopecia

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Sir,

Androgenetic alopecia (AGA) is hereditary and androgen-dependent, progressive thinning of the scalp hair that follows a defined pattern. It is a common dermatological problem affecting both men and women, with significant negative impact on their social and psychological well being.[1] It commonly begins by 20 years of age and affects nearly 50% of men by the age of 50 years.[1] Its etiopathogenesis is mainly androgen dependent and modulated via the testosterone metabolite dihydrotestosterone (DHT) and the expression of hair follicle-related androgen receptor.[2] The genetic factors also have been implicated in the pathogenesis of AGA.[2] Patients afflicted with AGA suffer from severe impairment of quality of life and thus treatment of this condition is mandatory, requiring long-term treatment with chief concerns about the efficacy and safety of the product used. Currently only oral finasteride and topical minoxidil are approved for treatment of AGA.[3,4] Recently, certain newer advances have shown caffeine to have beneficial effects in patients suffering from AGA. The proposed mechanism which would counteract DHT-induced miniaturization of the hair follicle include inhibition of phosphodiesterase by caffeine, which increases cAMP levels in cells and therefore promotes proliferation by stimulating cell metabolism.[5] A study conducted by Fischer *et al*. used hair organ culture model to investigate the effects of testosterone and caffeine on hair follicle growth stimulation. This *in vitro* study used scalp biopsy samples from male AGA patients which were cultivated using different concentrations of testosterone and/or caffeine for a period of 120-192 hours. Addition of caffeine in concentrations of 0.001% and 0.005% were found to counteract the suppressive effects of testosterone on hair growth, with a higher hair shaft elongation seen at 120 h after caffeine administration, compared to control group. This *in vitro* study thus clearly demonstrates that caffeine is a stimulator of human hair growth which may have importance in the treatment of AGA.[5] Brandner *et al*. proved by their double-blind placebo-controlled trial that caffeine application causes a substantial reduction in the transepidermal water loss in men compared to women, thus improving barrier function in men.[6] Regarding the route of delivery of caffeine, hair follicles are considered an important route for drug delivery. A recent study which assessed the follicular penetration of topical caffeine in hair follicles proved hair follicles to be faster route of drug delivery for topically applied drugs.[7] An important requirement for the treatment of AGA is follicular drug delivery. A recent study assessed the follicular penetration of caffeine on topical application in a shampoo formulation for 2 min and showed that penetration via hair follicles was faster and higher compared with the interfollicular route and that hair follicles were the only pathway for faster caffeine absorption during the first 20 min after application.[8]

The beneficial effects of topical application of caffeine in AGA can thus be attributed to inhibition of phosphodiesterase, improvement in barrier function, follicular penetration, stimulation and promotion of hair growth. Thus it appears to be a useful adjuvant in the management of AGA. However, further studies need to be done to confirm and establish the role of caffeine in management of AGA.

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