

MTS Spark Waves™ in androgenic alopecia (hair loss)

Introduction

Male pattern hair loss (MPHL) and female pattern hair loss (FMPH) are typically experienced as a "moderately stressful condition that diminishes body image satisfaction". Deleterious effects on self-esteem and certain facets of psychological adjustment are more apparent among women than men and among treatment-seeking patients¹. Pattern hair loss by the age of 50 affects about half of males and a quarter of females and represents the most common cause of baldness².

Conventional therapy includes medical treatment like Minoxidil, an antihypertensive vasodilator. Hypothetically, it is thought to widen blood vessels allowing increased flow of oxygen, blood and nutrients to the follicles. Its success is moderate and the treatment is not suitable for every patient. Another possibility of intervention is Finasteride, a 5 α -reductase inhibitor, interfering with the hormonal balance of the body and bearing the potential of unintended side-effects like e.g. erectile dysfunction or depression (post-finasteride syndrome). Finally, invasive and painful procedures as hair transplant surgery are performed.

Recent reports of the international society of shock wave therapy (ISMST) observed hair growth-promoting side effects on the skin of shock wave-exposed areas during the treatment of other indications and suggested it as a potential therapy for baldness. It is also already used by some aesthetic centers.

The biological mechanism

PHL is thought to be due to a combination of genetic and hormonal factors. In hair follicles, 5 α -reductase type 1 and 2, androgen receptors (AR) and AR coactivators can regulate androgen sensitivity of dermal papillae (DP). To regulate hair growth, androgens regulate production of growth factors and cytokines like IGF-1 (insulin growth factor), TGF- β 1 (transforming growth factor), TGF- β 2, and ILs (interleukins). In addition, androgens enhance inducible NOS (nitric oxide synthase) from occipital DP cells and stem cell factors for regulation of hair growth. Moreover, androgenic alopecia involves crosstalk between androgen and Wnt/ β -catenin signalling.³

It was previously shown, that **Spark Wave™ Therapy (SW™T)** induced activation of numerous growth factors like endothelial NOS, IGF, TGF- β , VEGF (vessel endothelial growth factor), FGF (fibroblast growth factor), ILs and PCNA (proliferating cell nuclear antigen) leading to angiogenesis and revascularization in the affected areas⁴⁻⁶. NO became elevated upon SW™T and enhanced tissue perfusion, partially due to the increased performance of nitric oxide synthase (NOS)⁷⁻⁹. NO, as a potent vasodilator, leads to improved blood and nutrient supply of the tissue and increases overall blood circulation. Hence, by mechanotransduction, SW™T strongly induces cascades of cell proliferation, tissue remodelling and regeneration¹⁰.

Microneedling is a relatively new, minimally invasive procedure involving superficial and controlled puncturing of the skin by rolling with fine miniature needles. It was initially introduced for skin rejuvenation, however, now it is used for a wide range of indications including acne scars, post-traumatic/burn scars, alopecia, skin rejuvenation, drug delivery, hyperhidrosis, stretch marks and many more.¹¹ Micropunctures are created using microneedles which produce a controlled skin injury without actually damaging the epidermis. These microinjuries lead to minimal superficial bleeding and set up a wound healing cascade with release of various growth factors such as platelet derived growth factor (PGF), transforming growth factor alpha and beta (TGF- α and TGF- β), connective tissue

activating proteins, connective tissue growth factors, and fibroblast growth factor (FGF).¹¹ The use of microneedling over scalp for alopecia is one of its recent advances but already some preliminary, encouraging studies have been performed ¹²⁻¹⁵.

Our new concept of Spark Wave™-assisted, minimally invasive treatment of androgenic alopecia combined with microneedling represents a cost-effective, therapeutic alternative to surgical hair transplant.

Under research:

**The concept of Spark Wave™ Therapy-assisted treatment of androgenic alopecia:
a therapeutic alternative to surgical hair transplant?**

The concept

The dermaroller with microneedles of medical grade, usually 0.5-3 mm long, will create microdamages to the epidermis and dermis by rolling action. This results in activation of body's own repair mechanism. When applied to the scalp, it will increase the number of hair follicles and also strengthen and accelerate growth of the existing hair. However, due to a certain restriction of body's own repair mechanism (homeostasis), the therapeutic effects are still limited. When assisted by SW™T, which on its own leads to fast and intensive hair growth, drastic changes can be expected. On the basis of induced angiogenesis and regeneration the microneedling and SW™T will lead to rapid hair growth as sufficient blood supply is crucial for maintenance, repair and growth of new hair follicles.

The perspectives

The combination therapy using microneedling and SW™T-assisted treatment of androgenic alopecia will exponentiate the outcome of enhanced hair growth. It is an office-based procedure consisting of multiple sittings which are minimally invasive and very cost-effective. The risk of unintended side-effects is very low and adverse events are really uncommon ¹⁶. The concept can be considered a safe and gentle alternative to surgical hair transplant. Due to its novelty, clinical trials are required to evaluate its efficacy.

The concept was invented together with Mirza Niaz Zaman, MD (General Medicine, 5th course), KNMU, Ukraine. If you are interested to discuss this project or want to manage or participate in a clinical trial please feel free to directly contact us for further discussion.

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